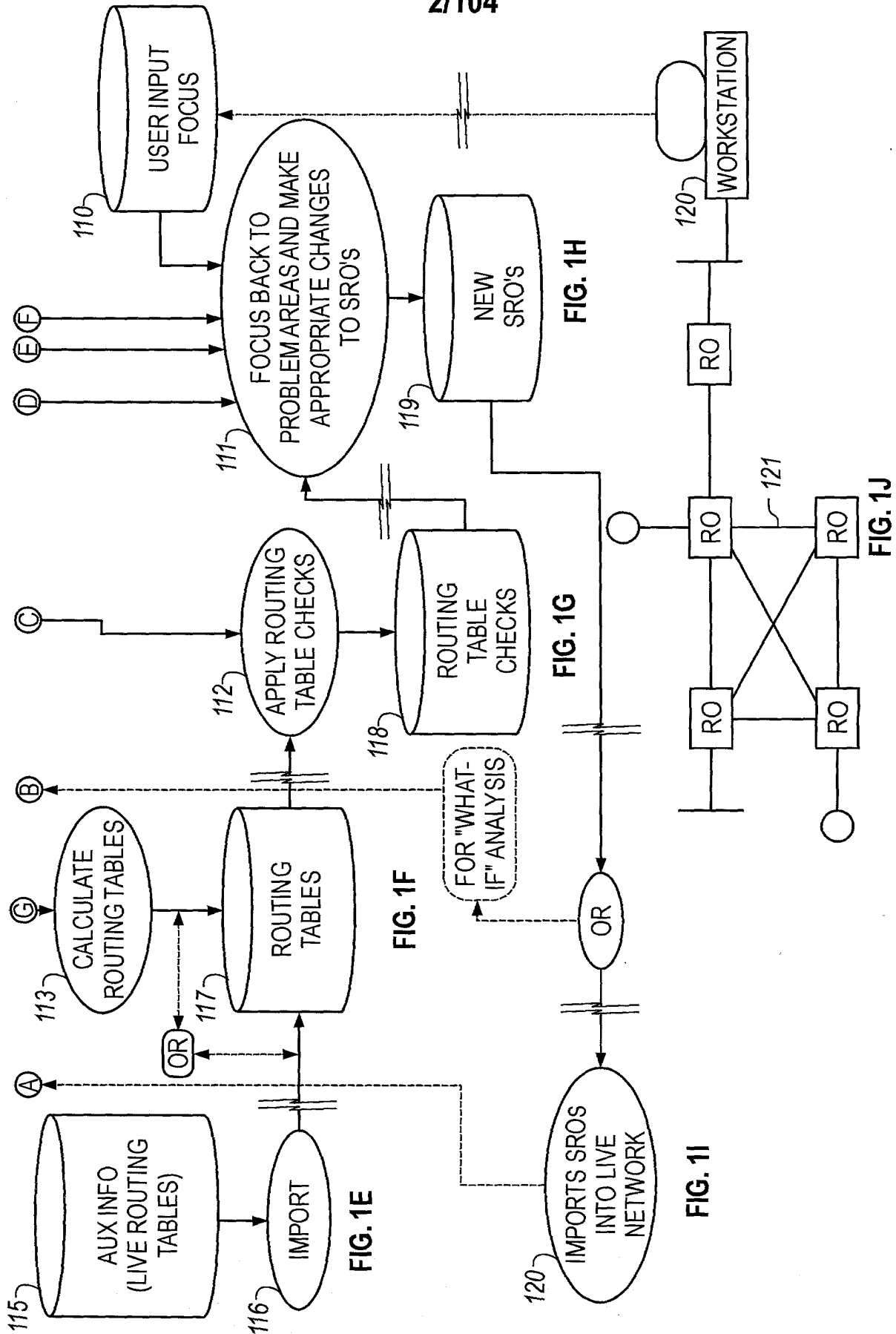


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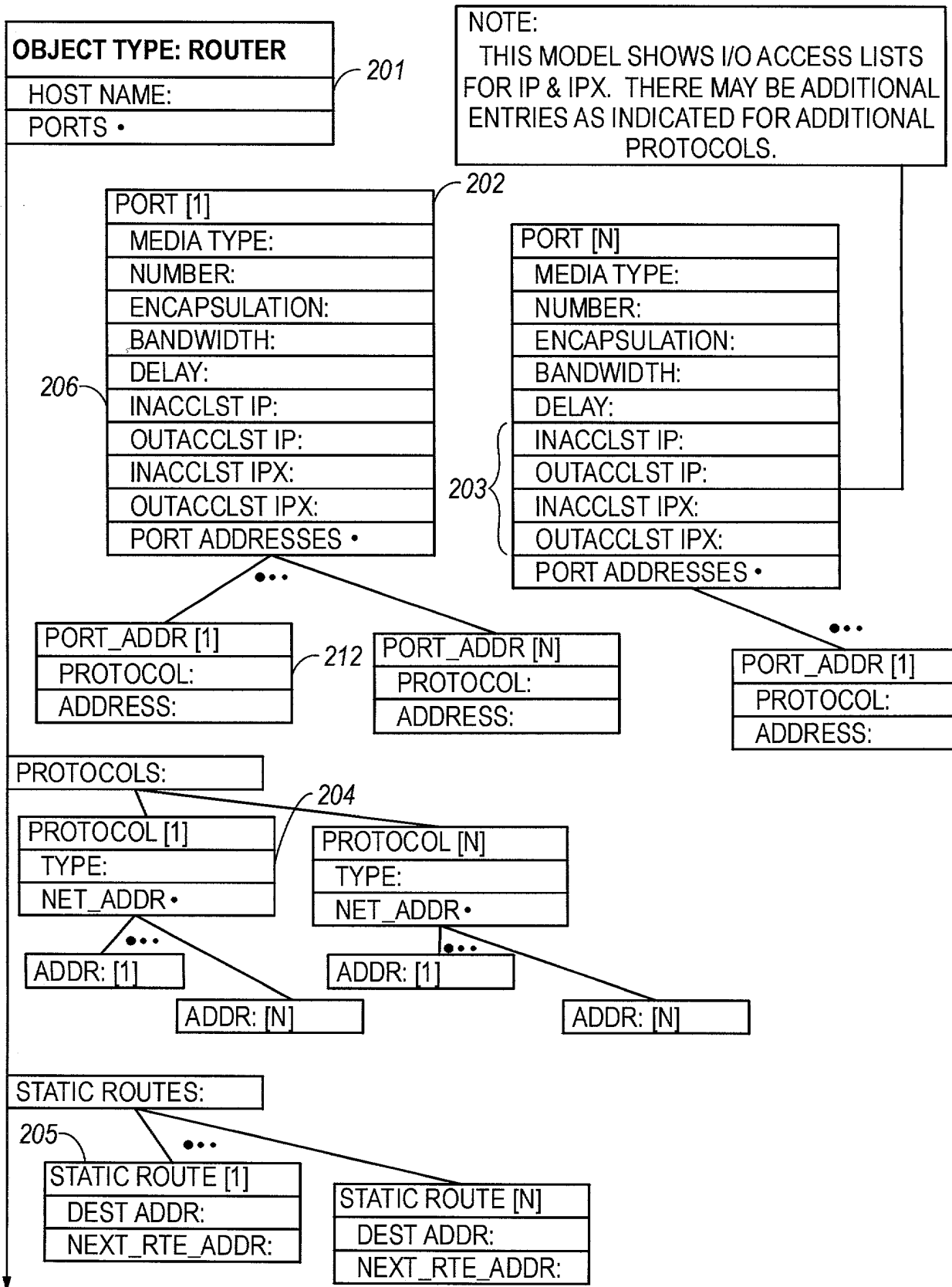


FIG. 2A

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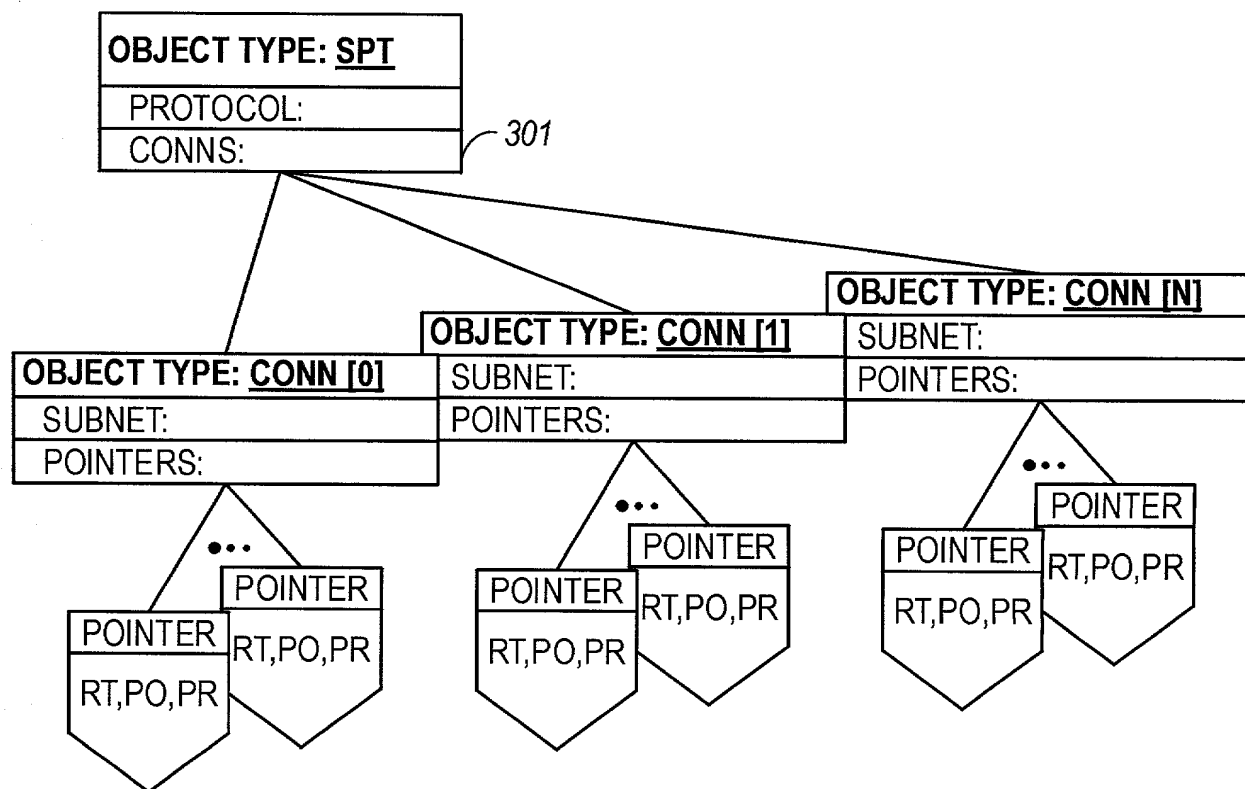
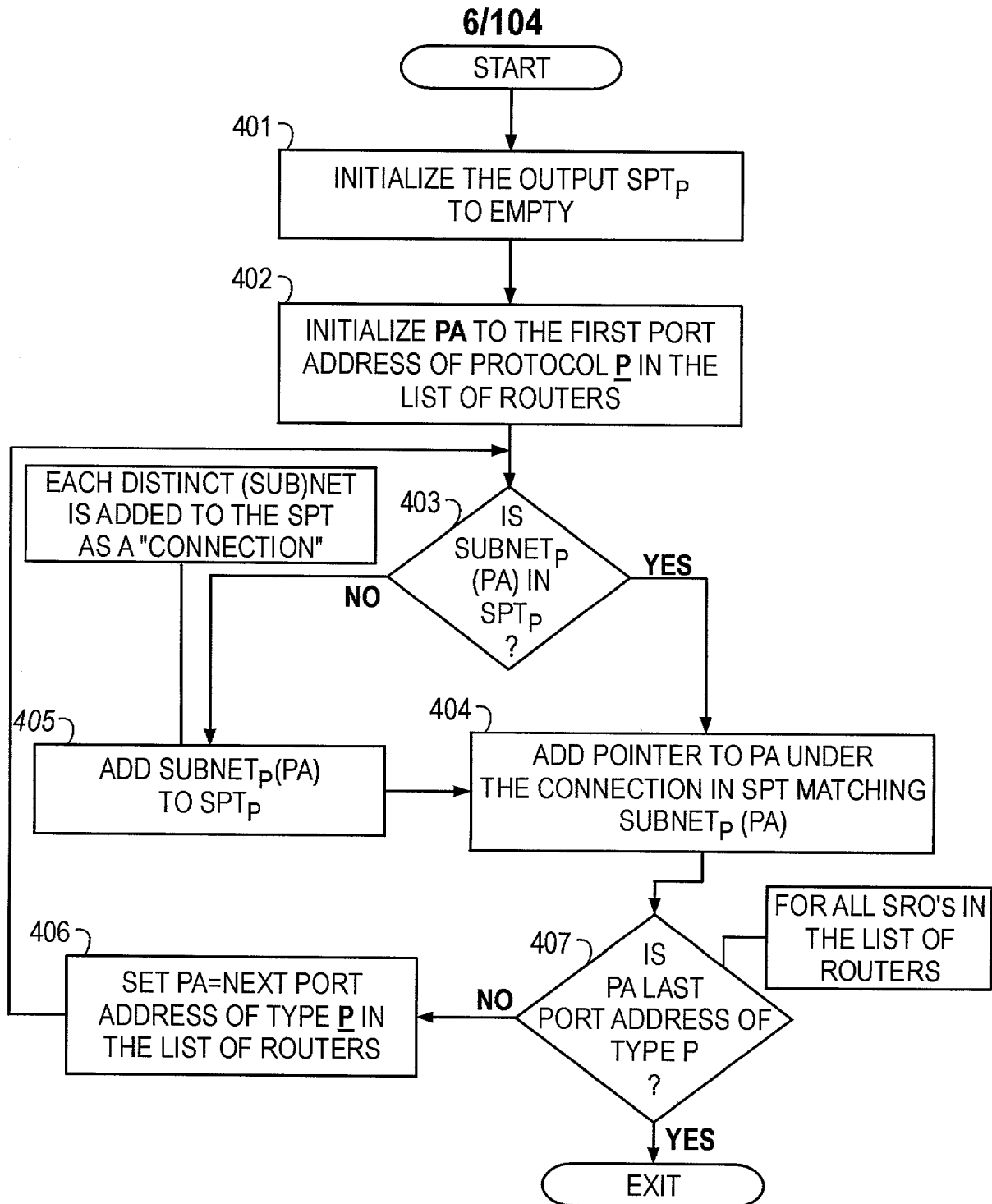


FIG. 3

NOTE:
 RT=ROUTER
 PO=PORT
 PR=PROTOCOL



NOTE- SUBNET FUNCTIONS ARE DETERMINED AS FOLLOWS:

SUBNET_{IP}([A1 M1]) = [A1 & M1) M1]
 WHERE "&" IS A BITWISE AND

SUBNET_{IPX}(NN)=NN
 WHERE NN = IPX SUBNET NUMBER

SUBNET_{APPLETALK}([CBRLB CBRUB]) = [CBRLB CBRUB]
 WHERE:CBRLB = CABLE RANGE LOWER BOUNDRY & CBRUB=CABLE RANGE UPPER BOUNDRY

FIG. 4

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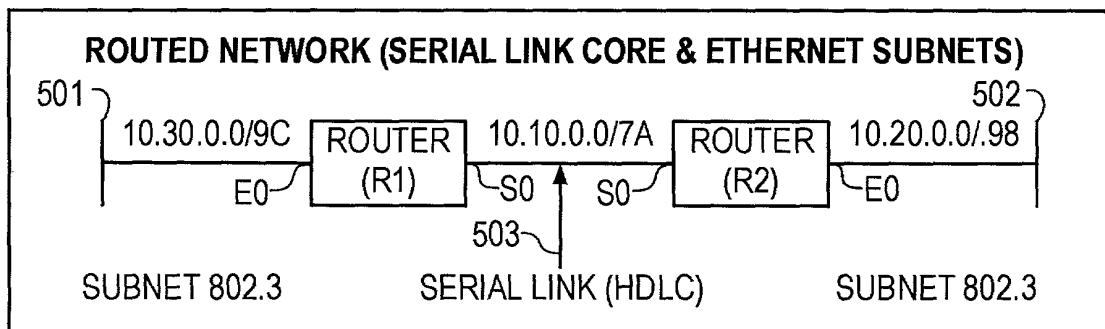


FIG. 5

ROUTER R1:

```

VERSION 10.0
!
HOSTNAME R1
!
NOVELL ROUTING 0000.0C08.94DD
!
INTERFACE ETHERNET0 602
IP ADDRESS 10.30.7.2 255.255.0.0
IPX NETWORK 9C
!
INTERFACE SERIAL0 601
IP ADDRESS 10.10.4.1 255.255.0.0
IPX NETWORK 7A
BANDWIDTH 1000
!
ROUTER IGRP 109
NETWORK 10.0.0.0
!
    
```

FIG. 6A

ROUTER R2:

```

VERSION 10.0
!
HOSTNAME R2
!
NOVELL ROUTING 0000.0C04.3A3E
!
INTERFACE ETHERNET0
IP ADDRESS 10.20.5.2 255.255.0.0
IPX NETWORK 98
!
INTERFACE SERIAL0
IP ADDRESS 10.10.4.2 255.255.0.0
IPX NETWORK 7A
!
ROUTER IGRP 109
NETWORK 10.0.0.0
!
! STATIC ROUTE DEFINITION
IP 70.70.3.0 255.255.0.0 199.37.28.3
    
```

FIG. 6B

100485 034001

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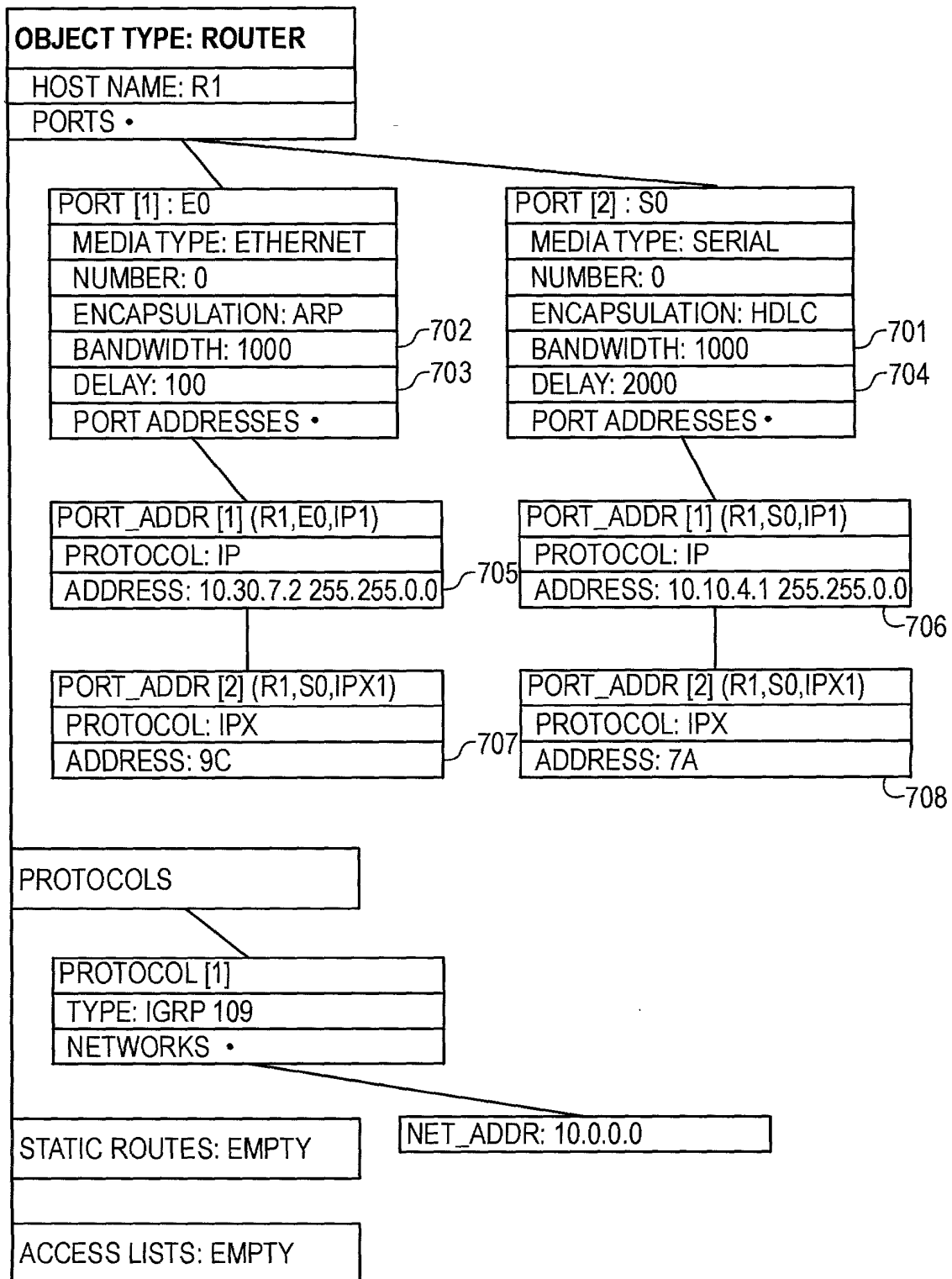


FIG. 7A

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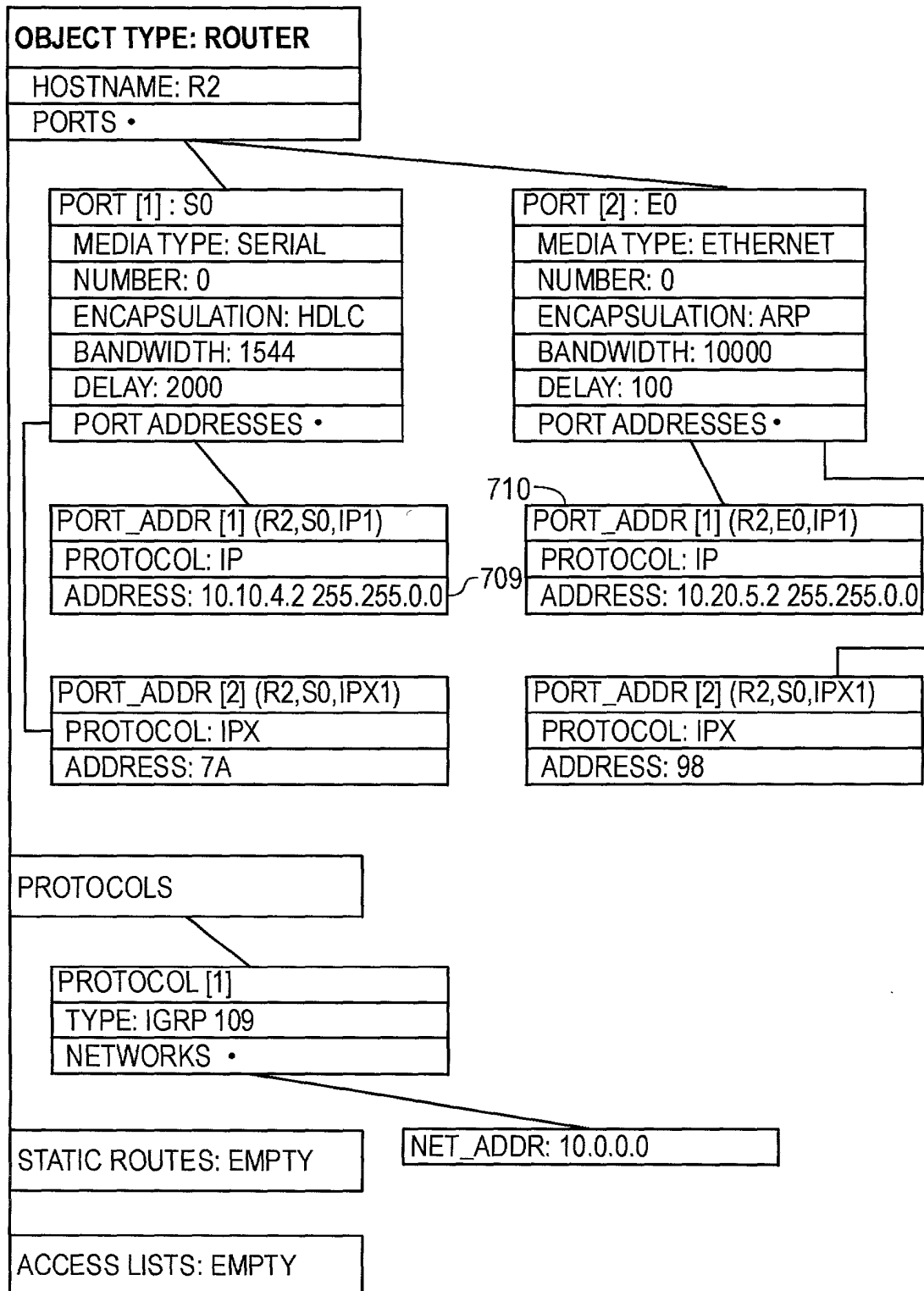


FIG. 7B

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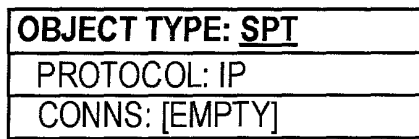


FIG. 8A

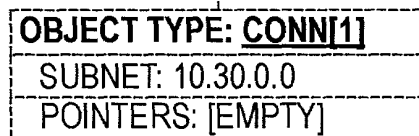
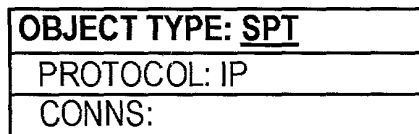


FIG. 8B

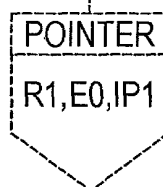
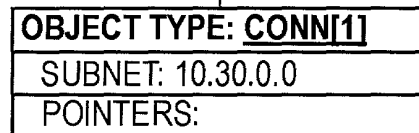
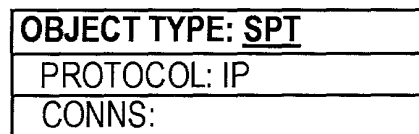
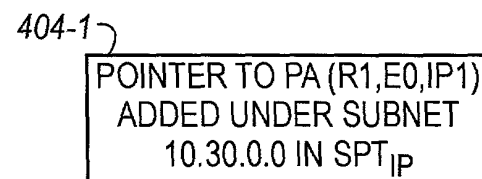
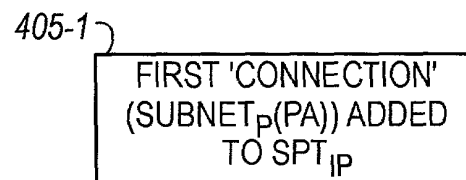
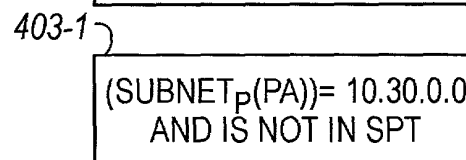
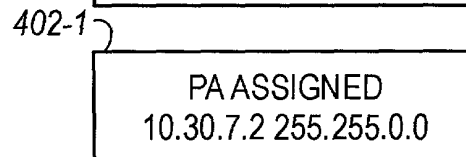
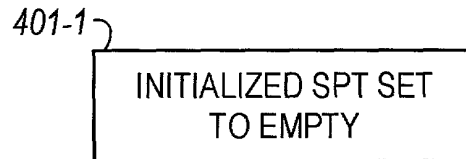
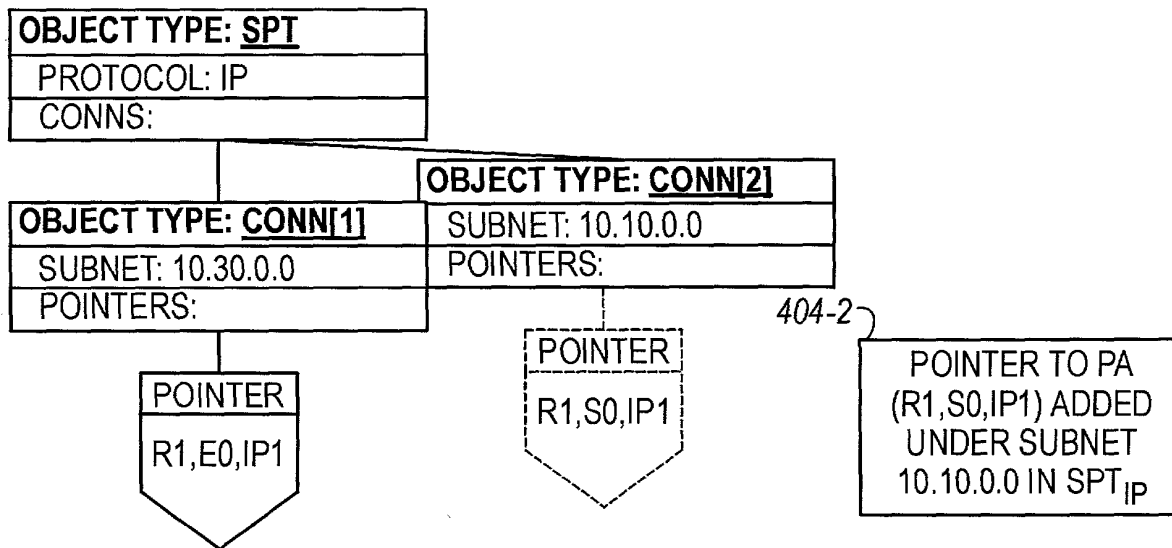
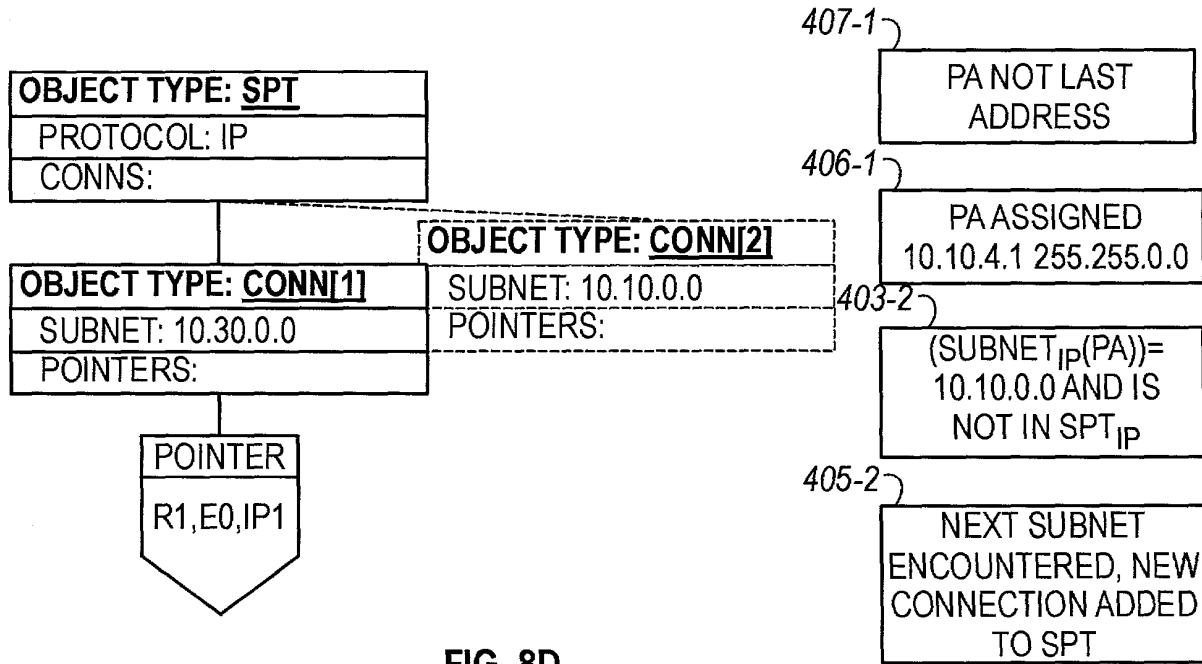


FIG. 8C



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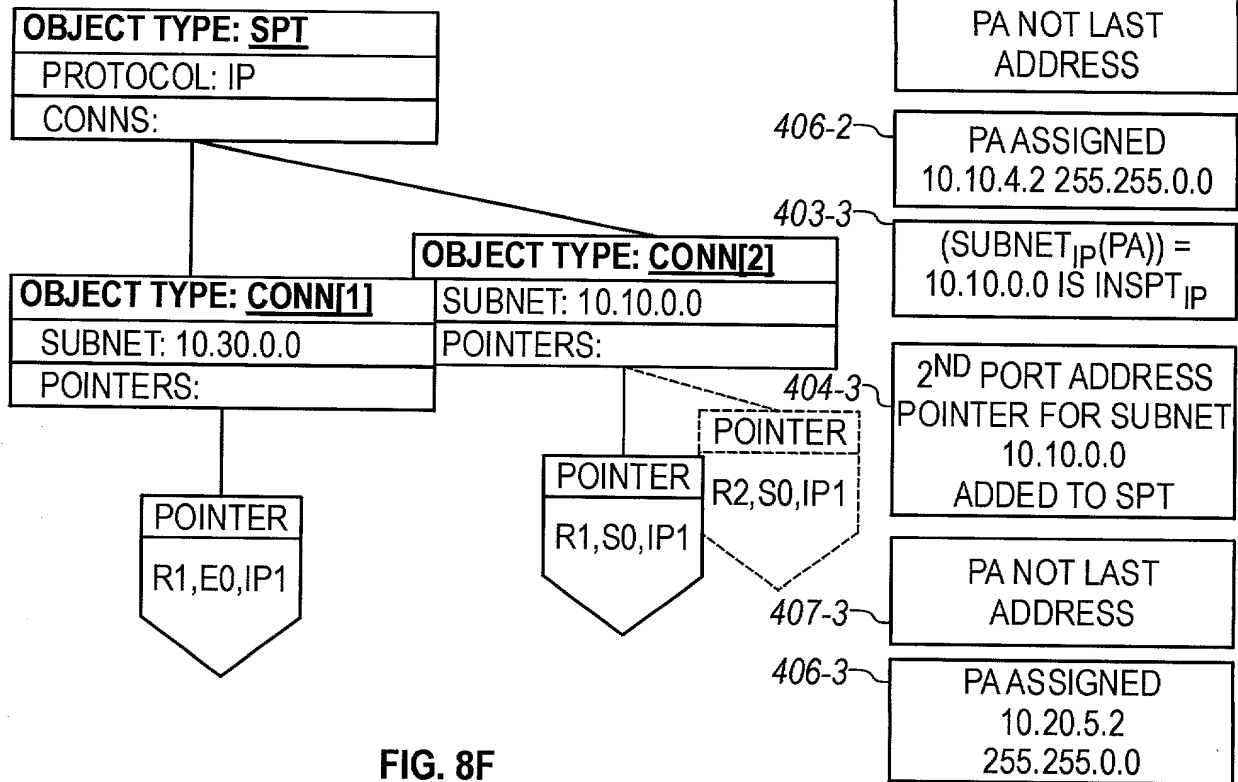


FIG. 8F

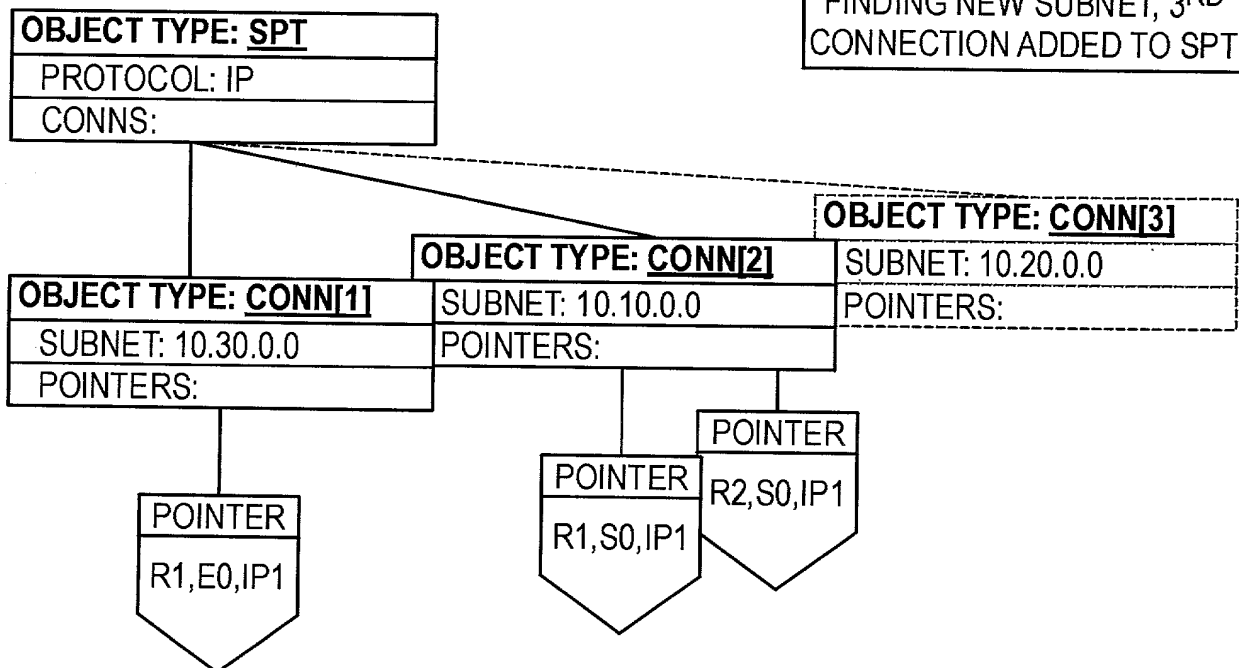


FIG. 8G

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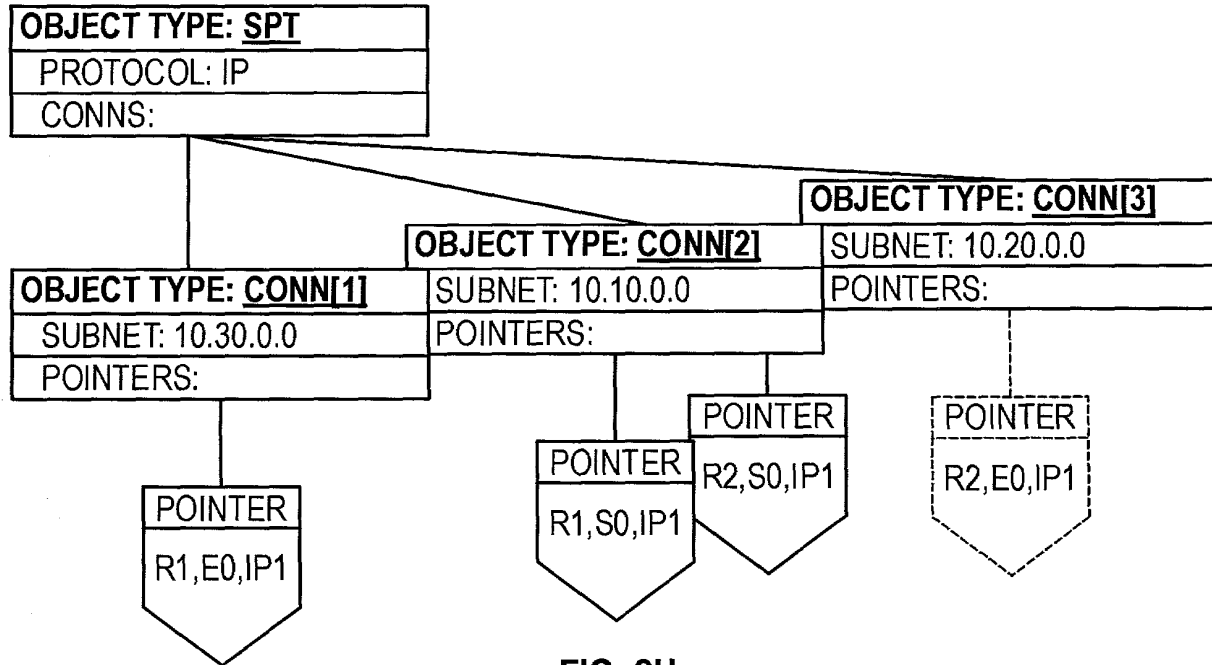


FIG. 8H

404-4 }
 PORT ADDRESS FOR SUBNET
 10.20.0.0 ENCOUNTERED,
 POINTER ADDED TO SPT

407-4 }
 LAST PORT ADDRESS
 ENCOUNTERED: SPT FOR IP
 COMPLETE

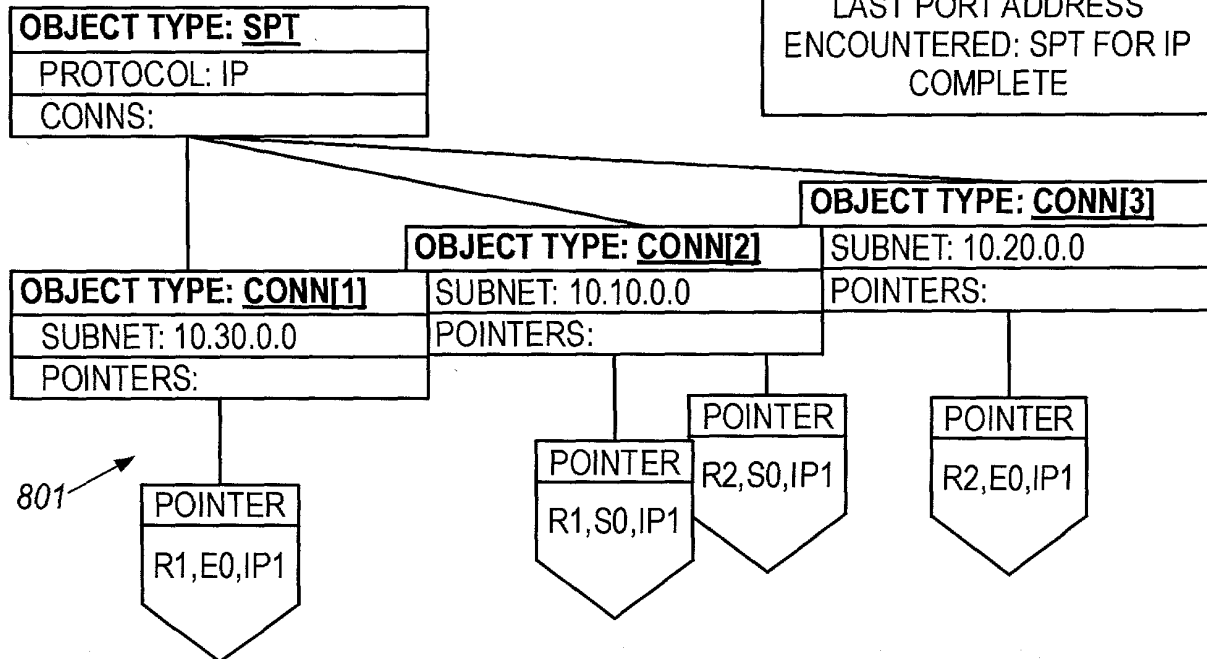


FIG. 8I

202405 5024001

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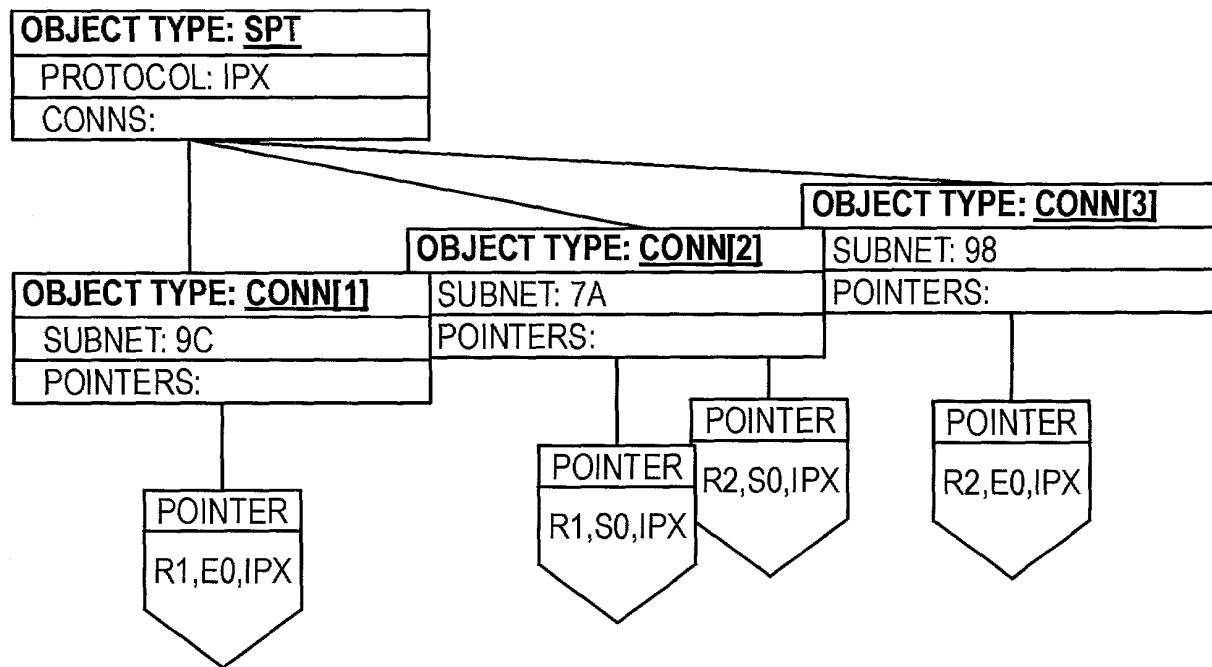
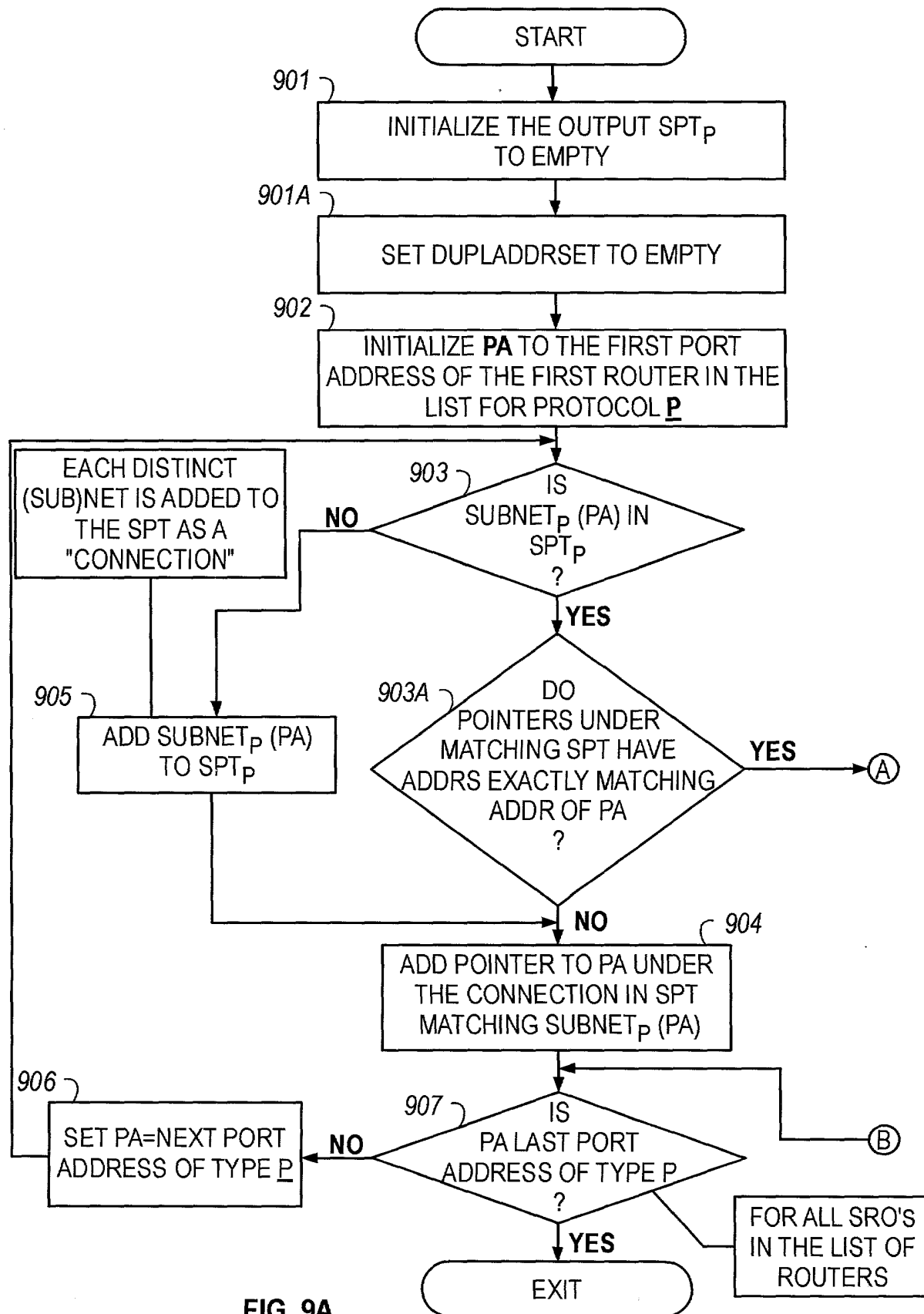


FIG. 8J

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NOTE
AS REFERRED TO IN THIS FLOWCHART THE TERM "DUPLADDRSET"
CONNOTES A SET OF PORT ADDRESS SETS THAT CAPTURE THE
PORT ADDRESSES THAT EXACTLY MATCH.
FOR EXAMPLE { {PA1, PA3, PA4} {PA9, PA7}} MEANS
PA1, PA3, & PA4 ALL REFER TO THE EXACT SAME ADDRESS
AND PA9 & PA7 REFER TO EXACTLY THE SAME ADDRESS

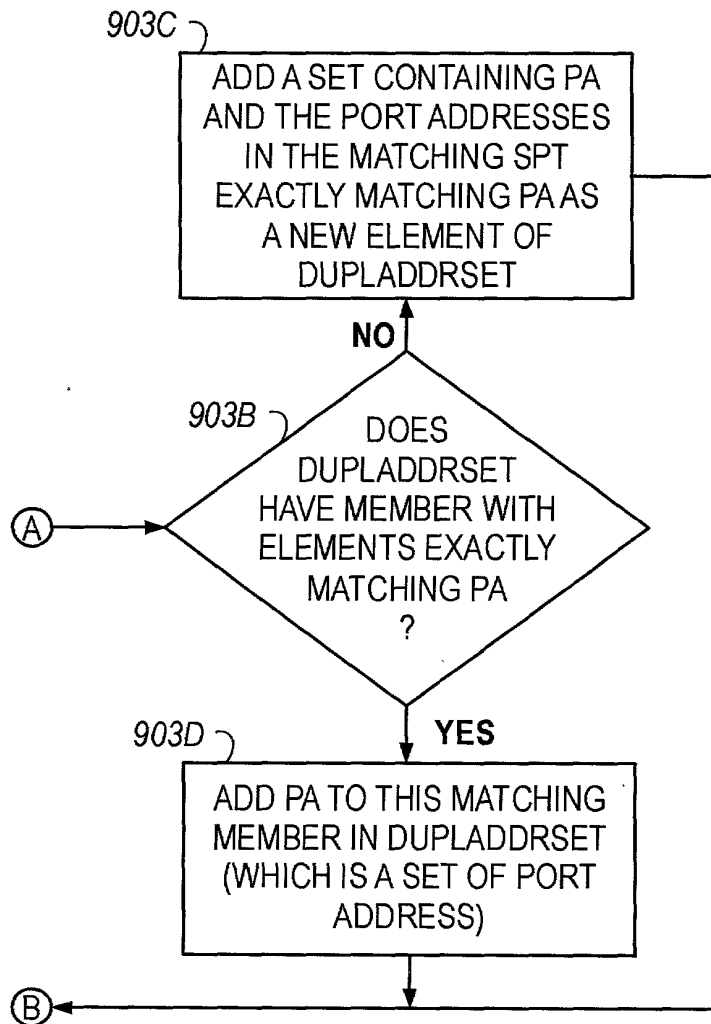
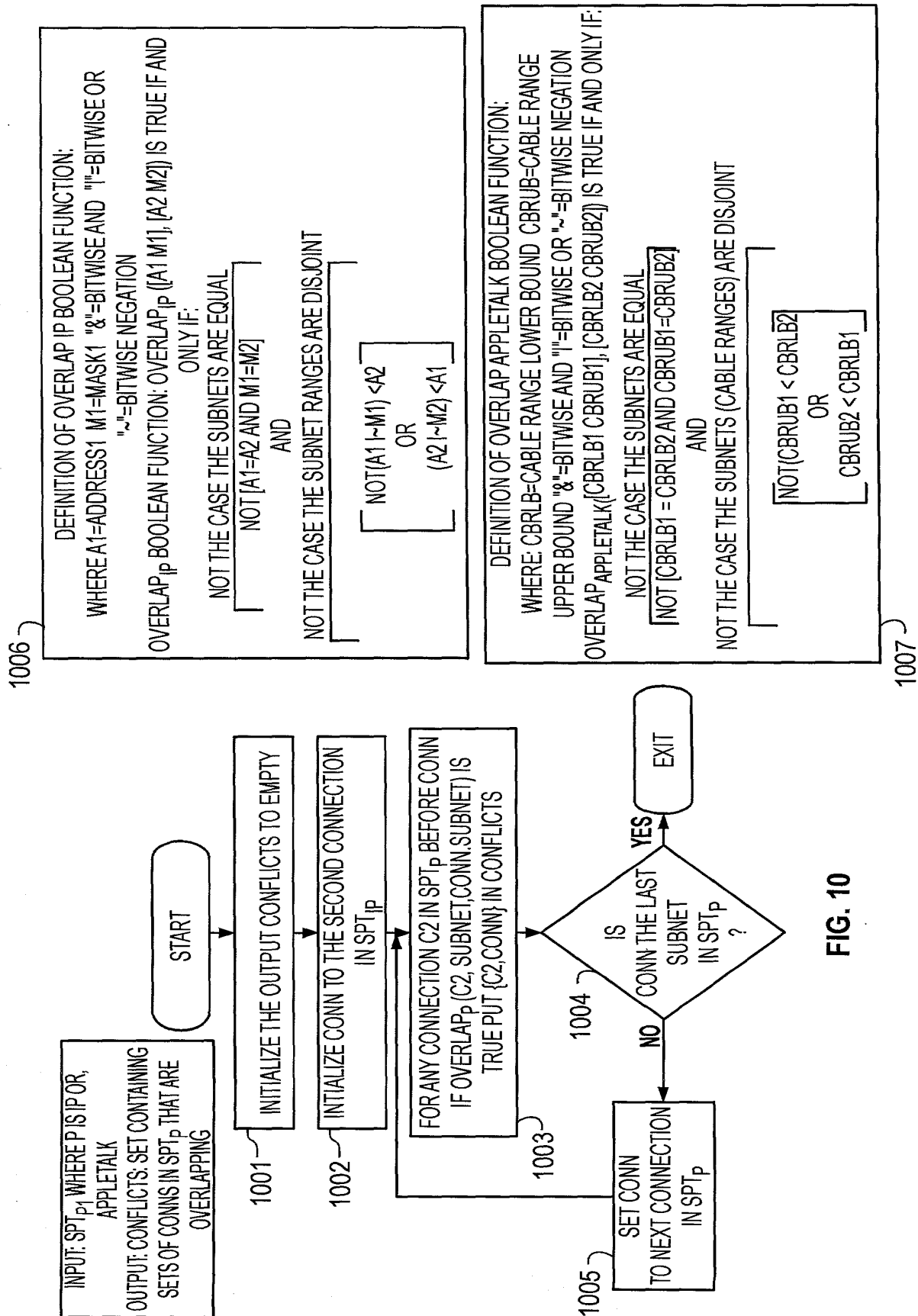
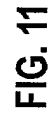


FIG. 9B

202 FEB 5084/00T

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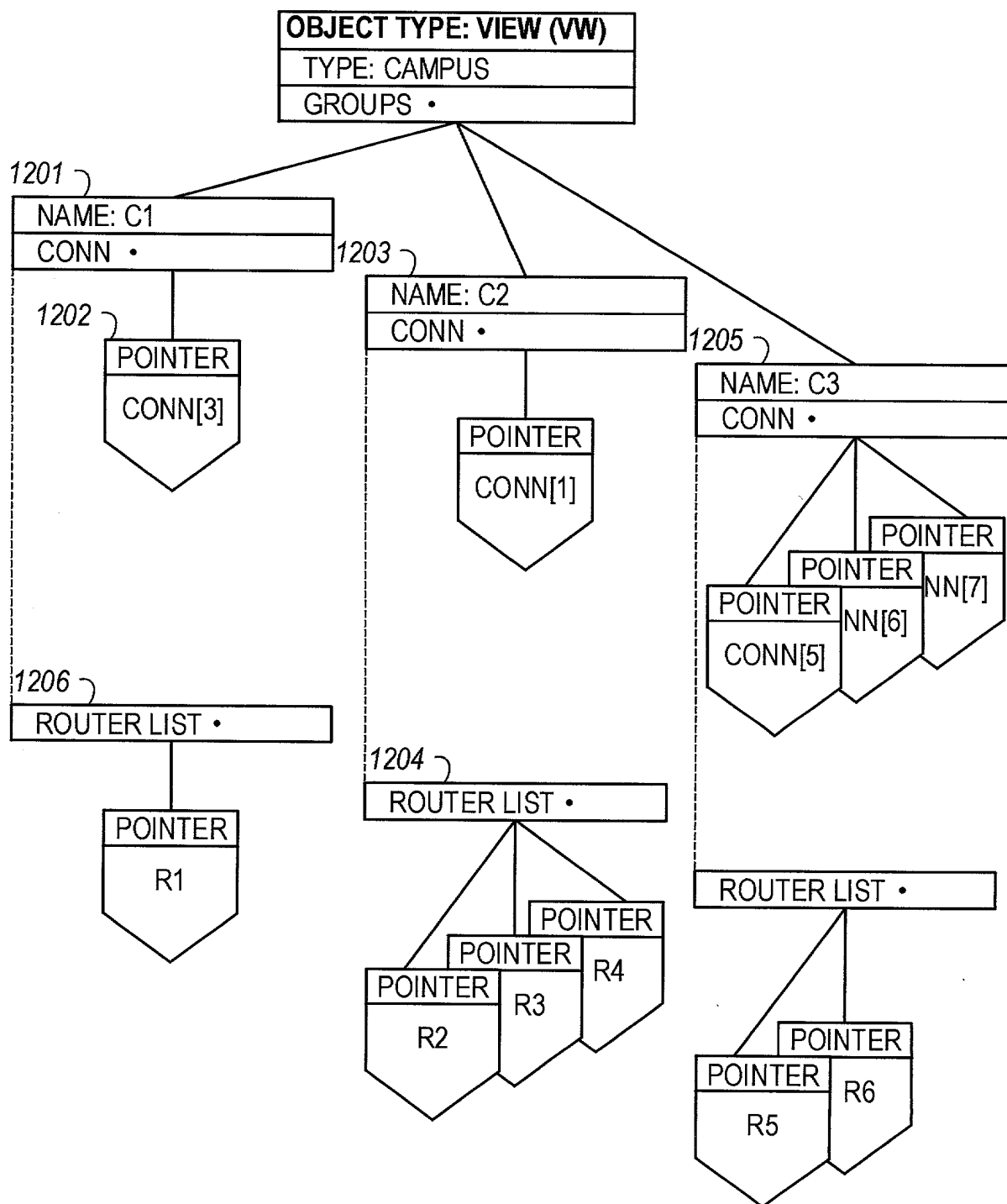
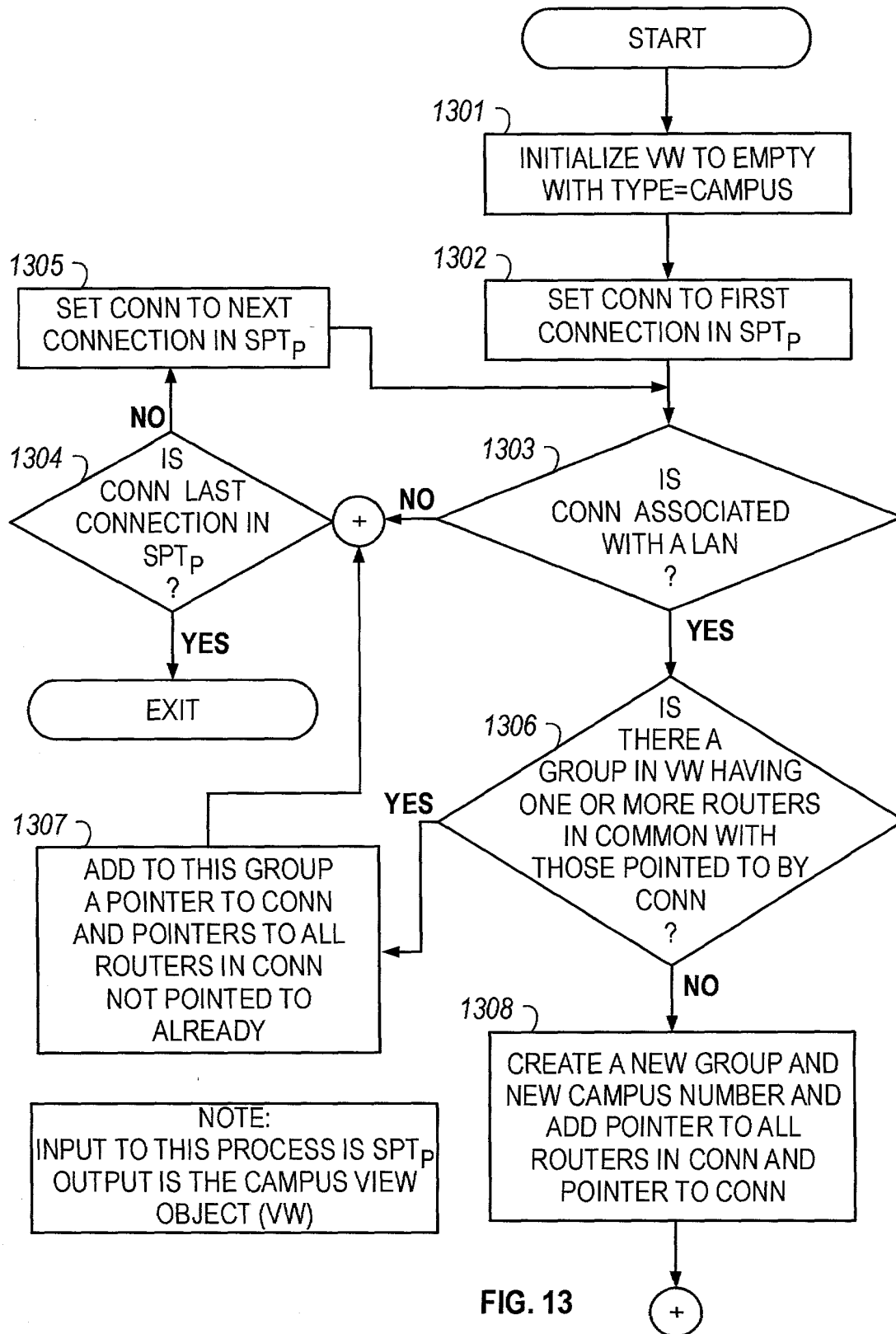


FIG. 12

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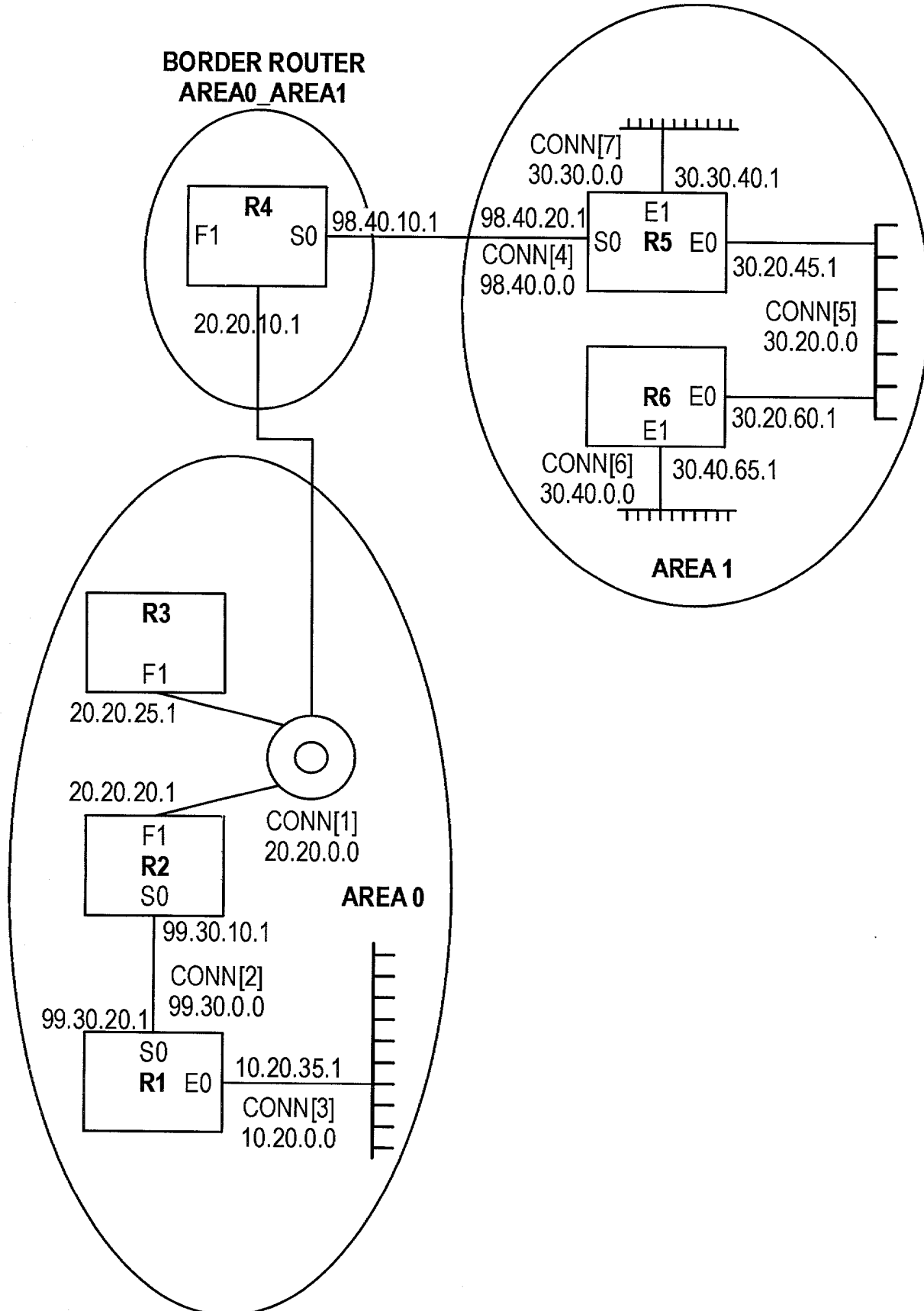


FIG. 14

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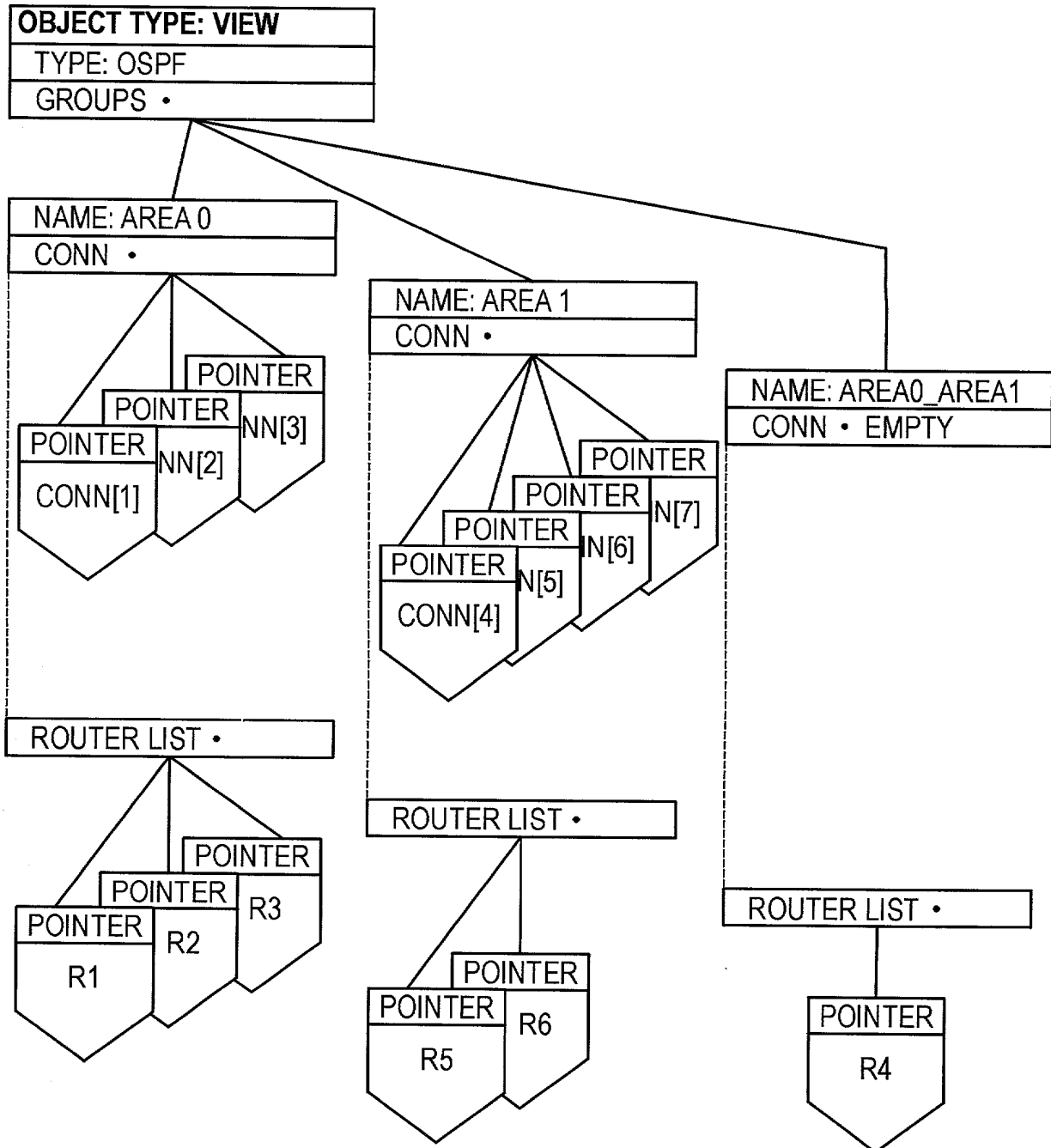


FIG. 15

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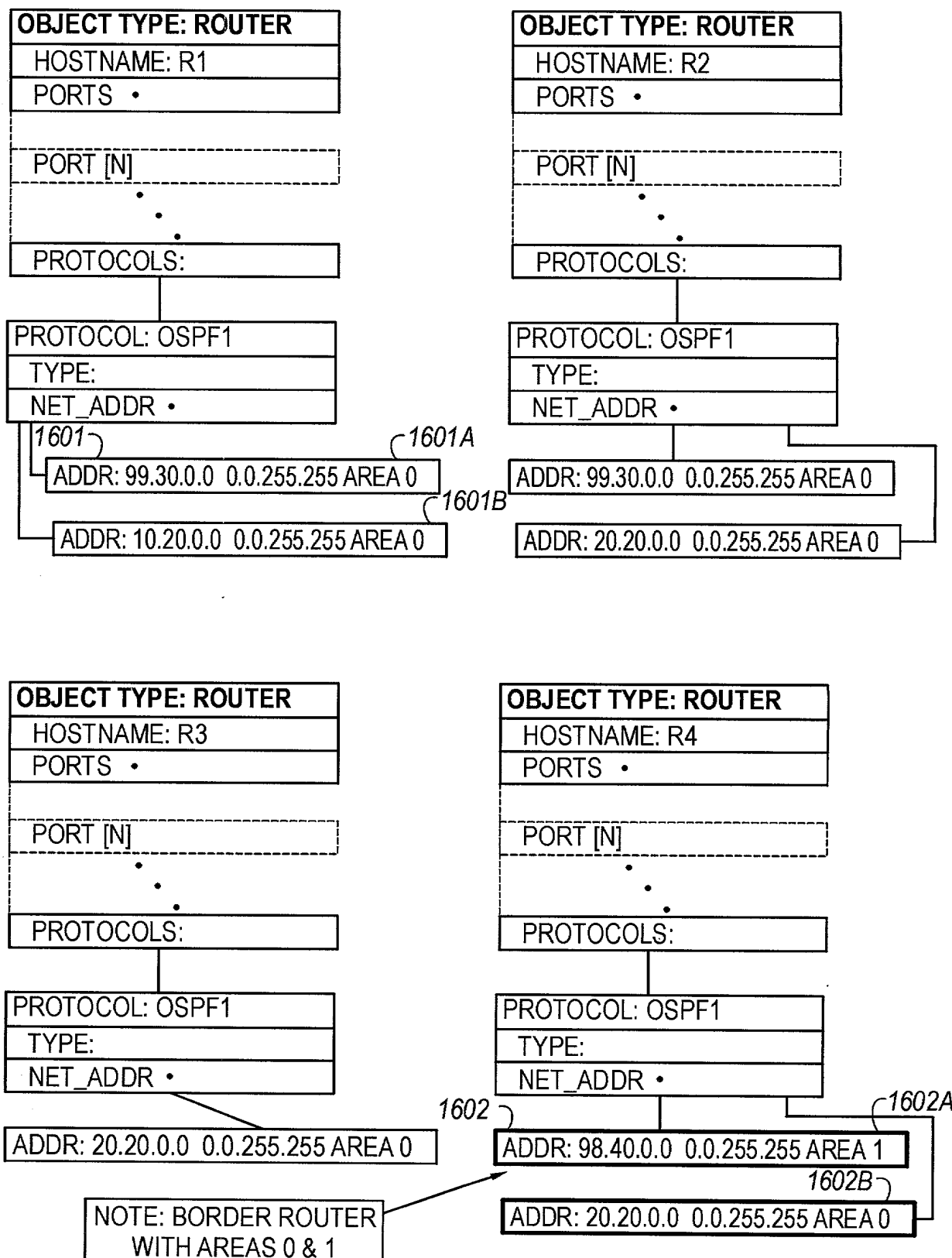


FIG. 16A

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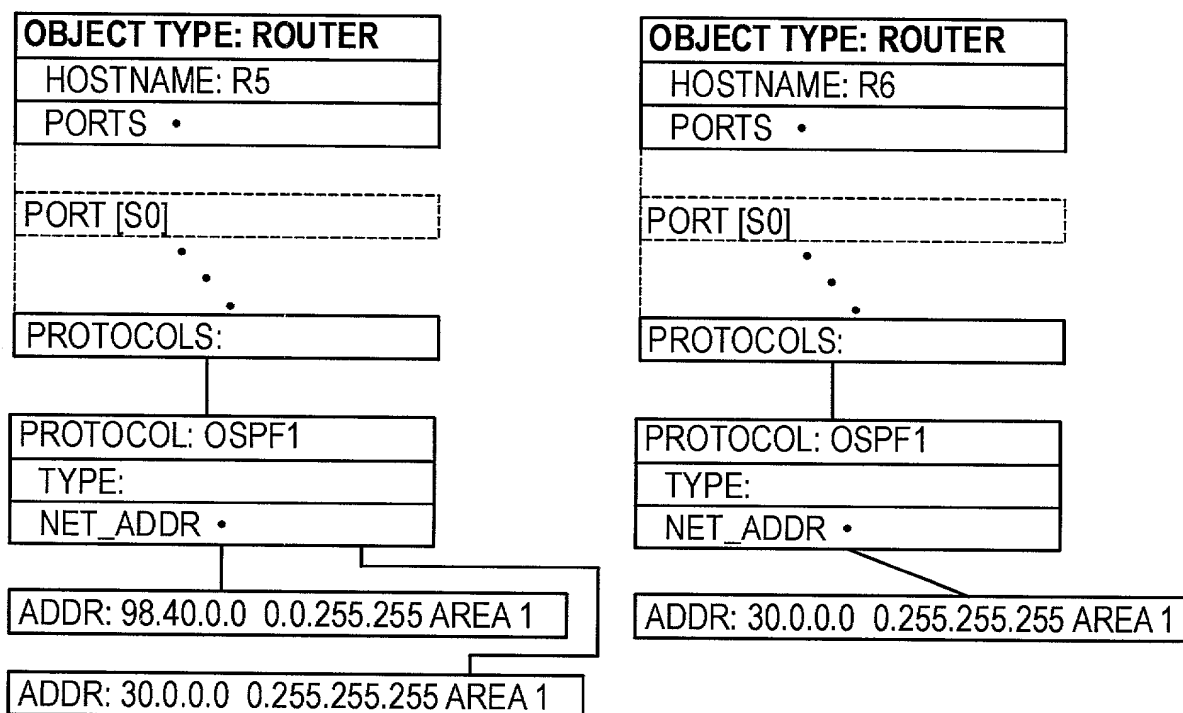


FIG. 16B

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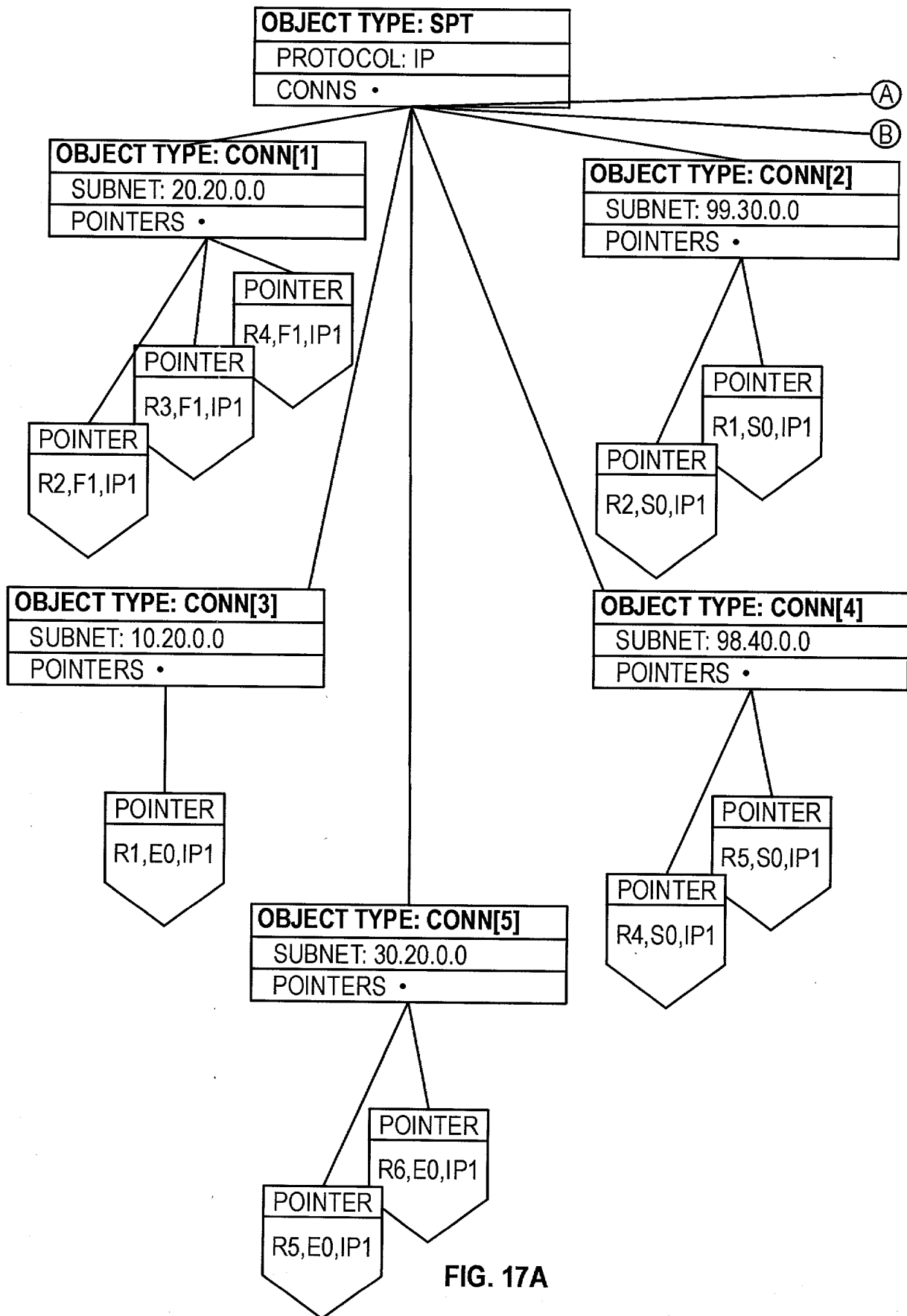


FIG. 17A

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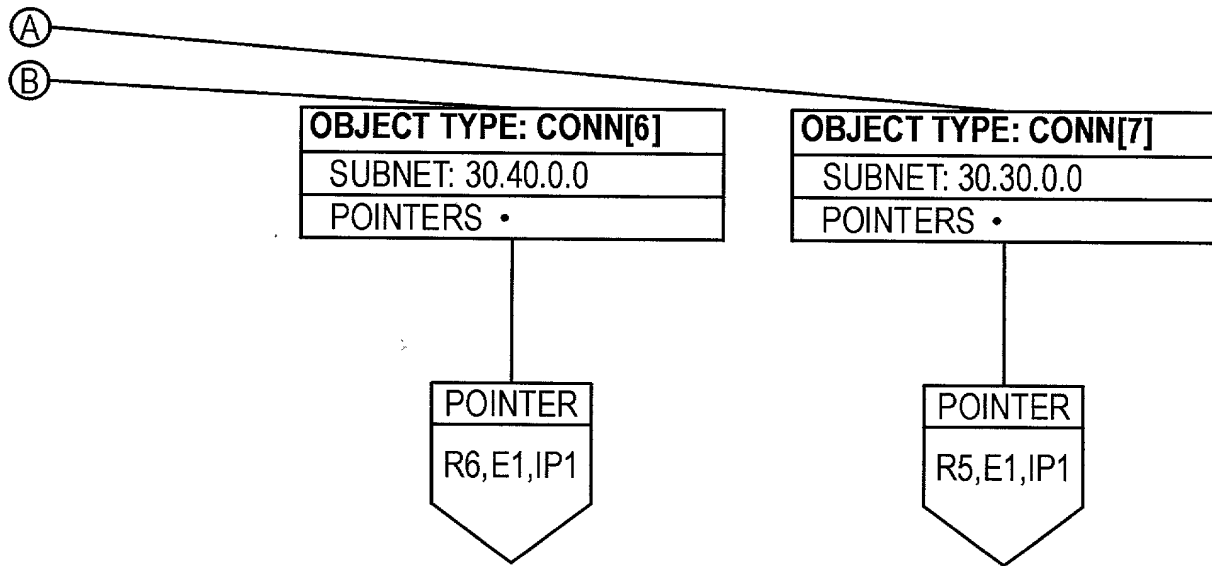
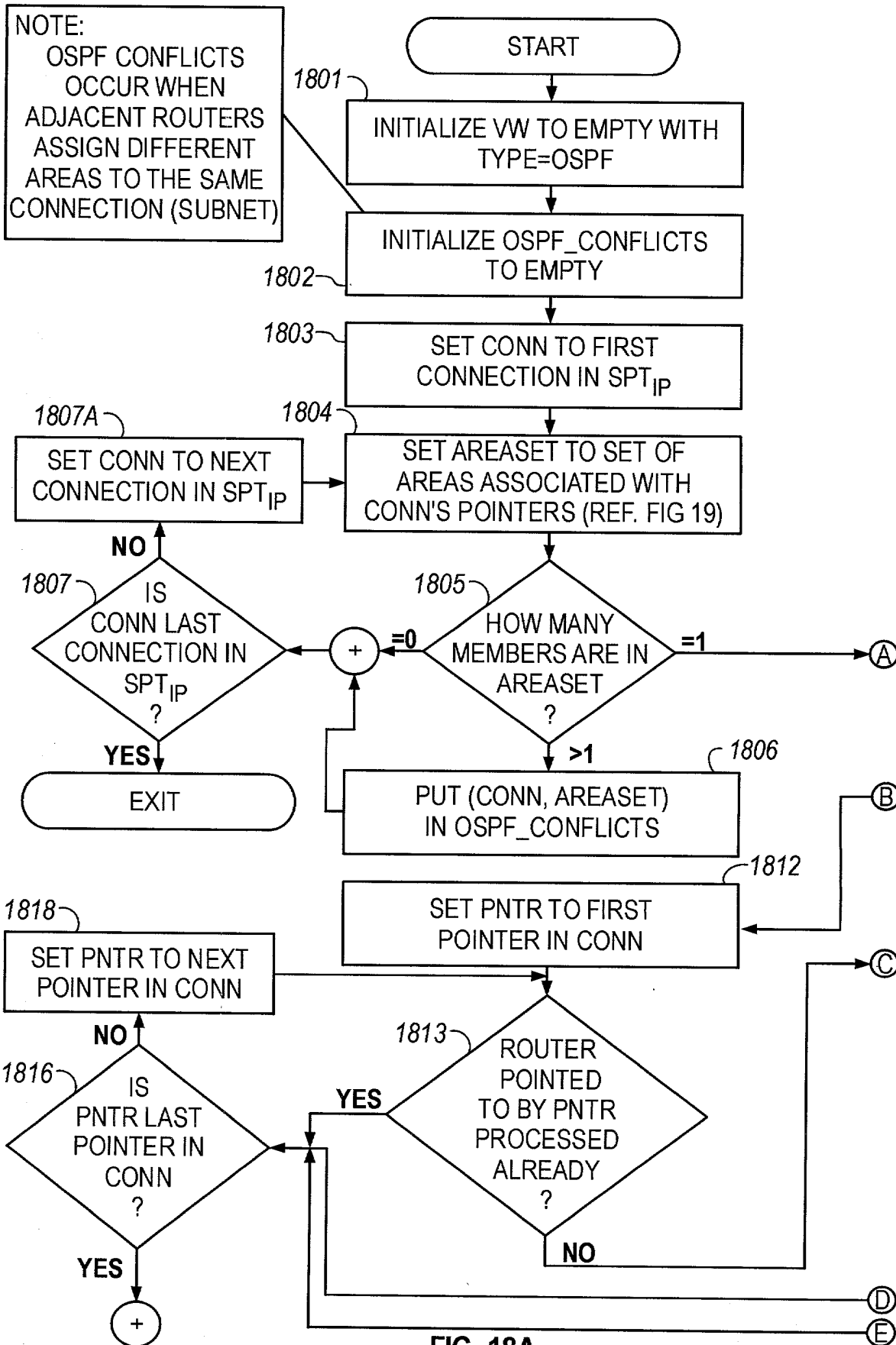


FIG. 17B

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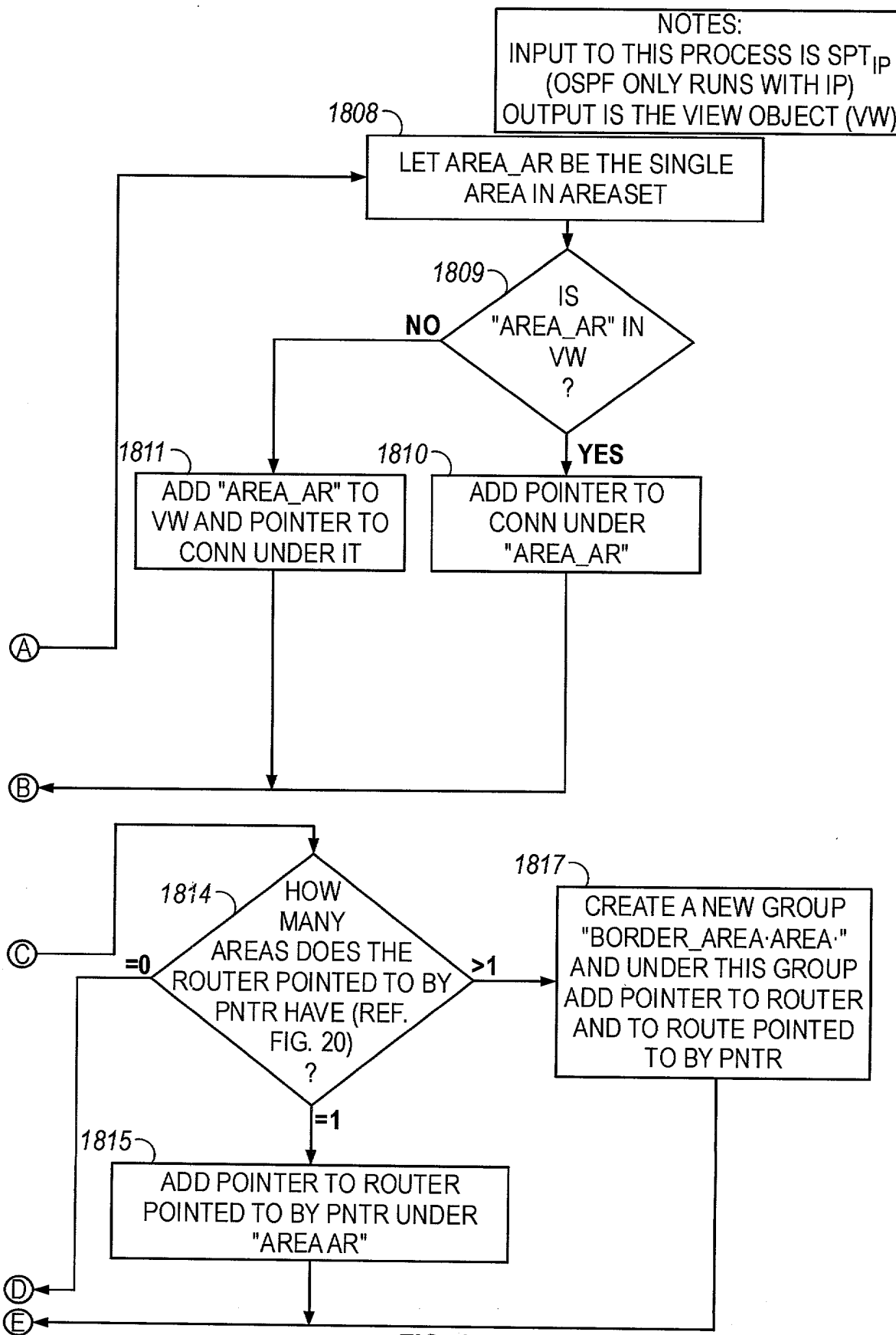


FIG. 18B

202120-508400F

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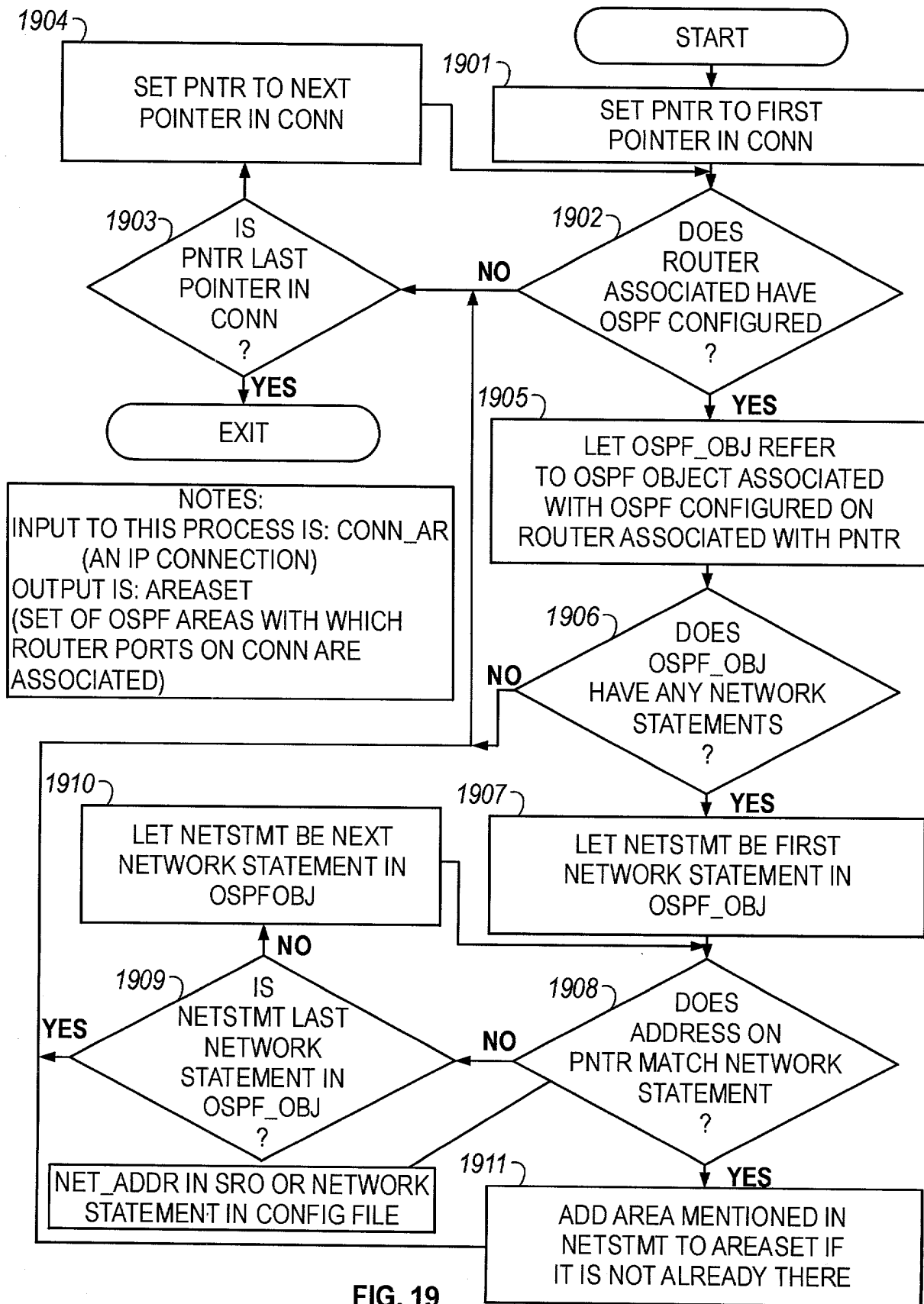


FIG. 19

20250305 09:20:00

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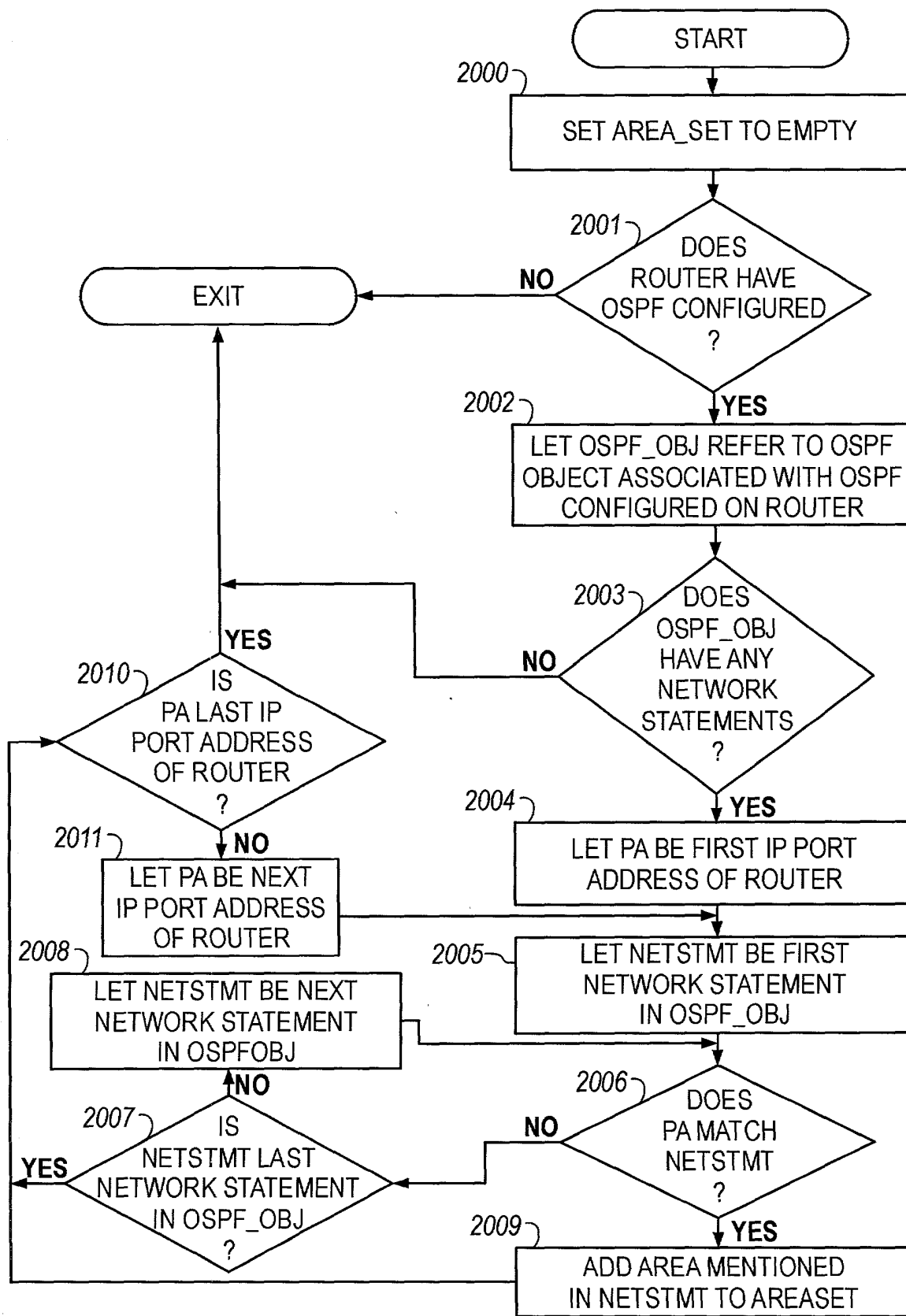


FIG. 20

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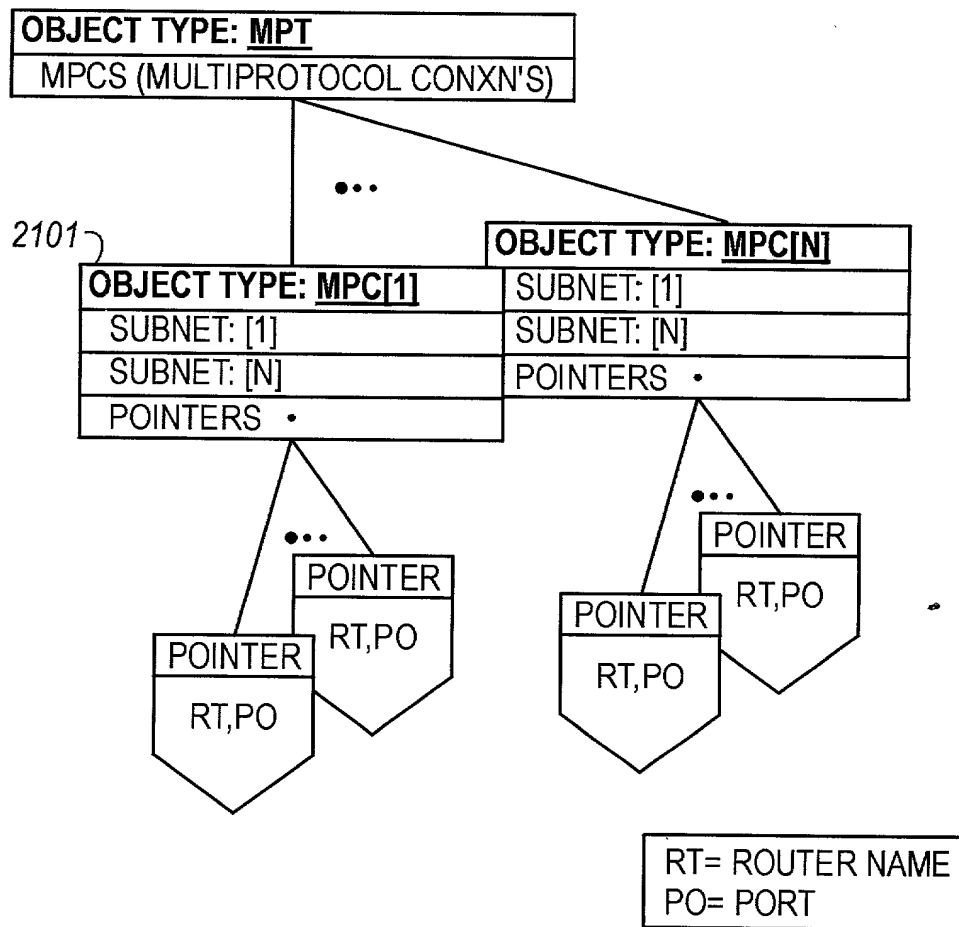


FIG. 21

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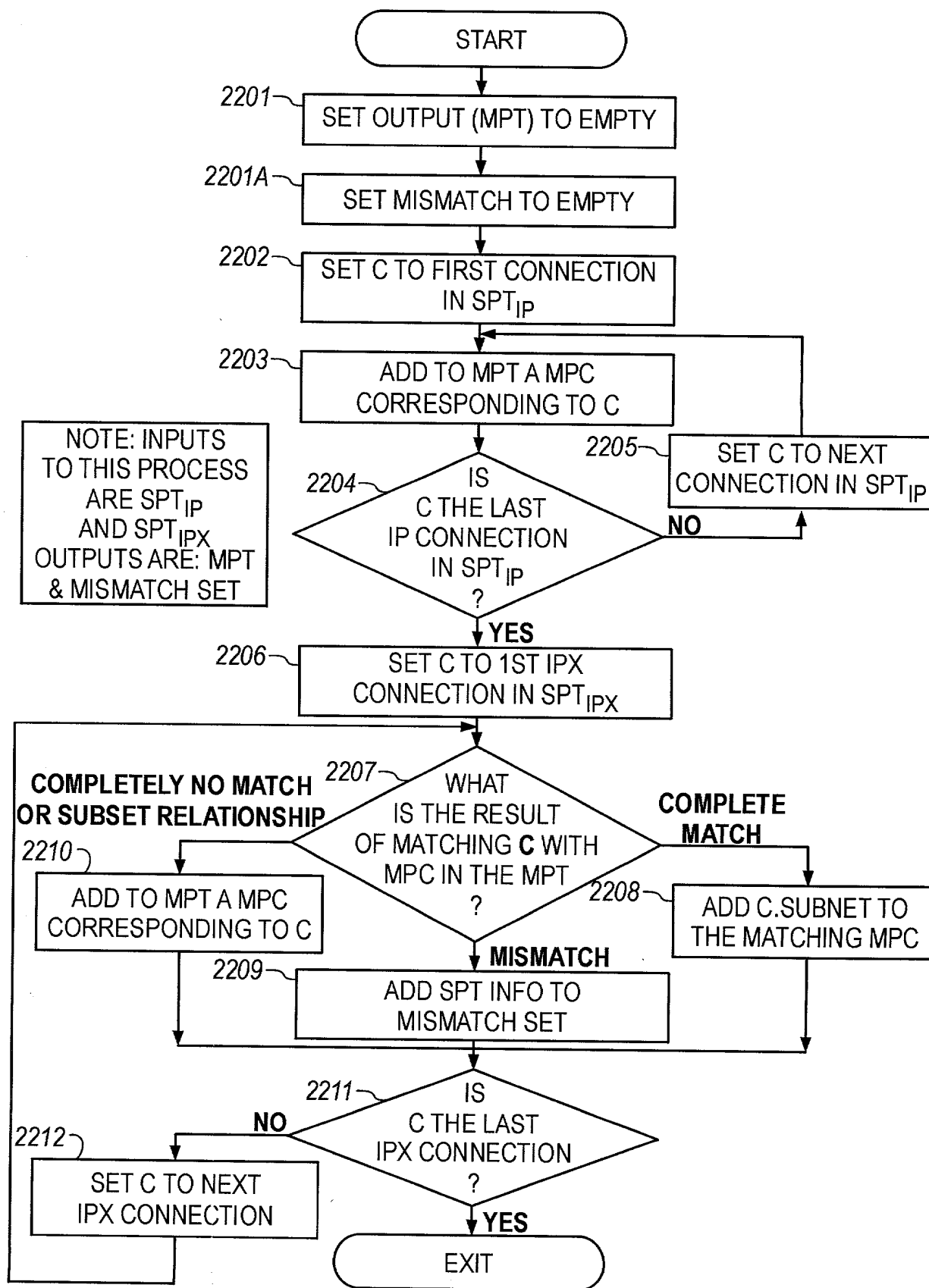


FIG. 22

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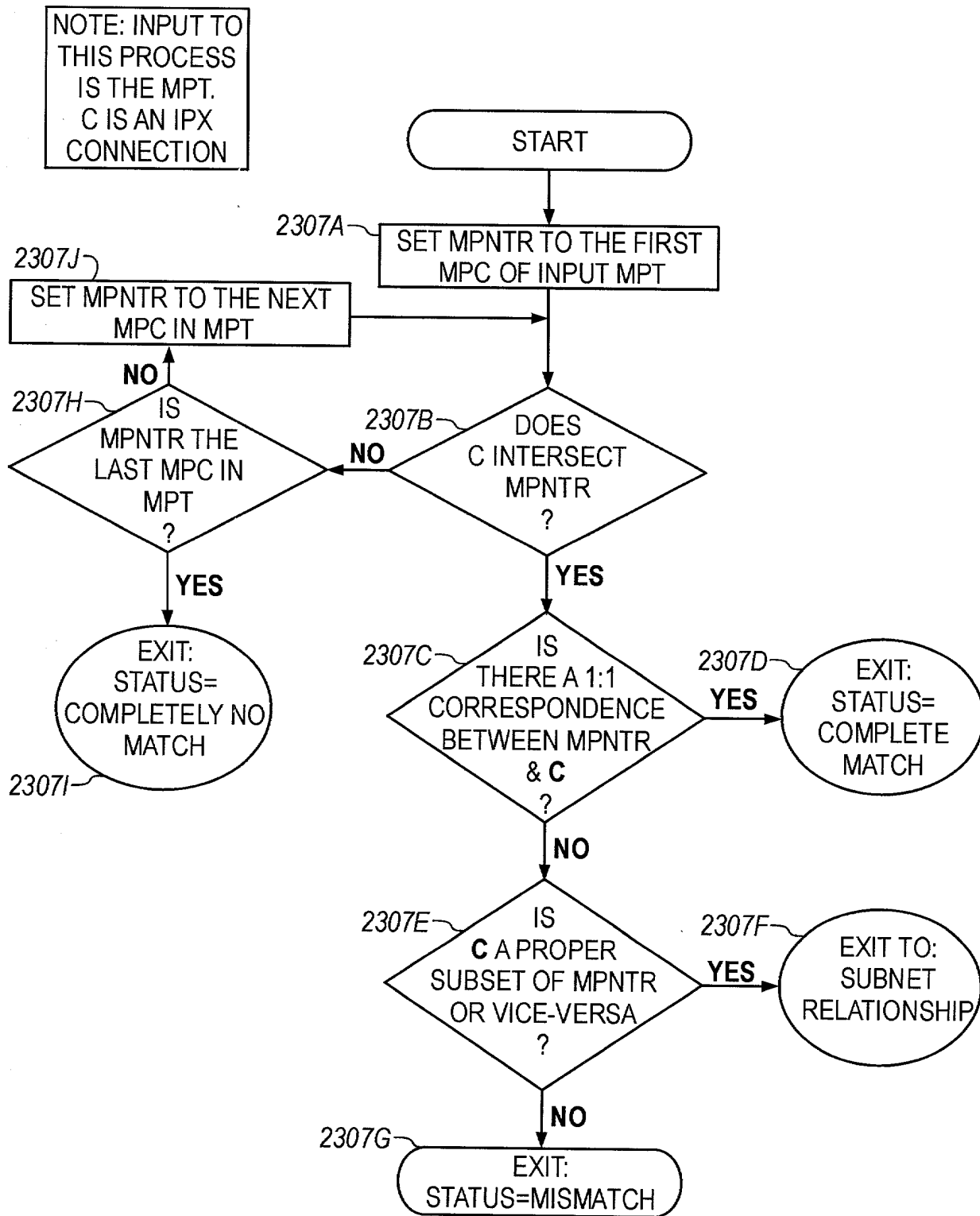


FIG. 23

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FIG. 24A

NOTE: INPUTS TO THIS PROCESS
 ARE: SPT_{IP} AND SPT_{IPX}

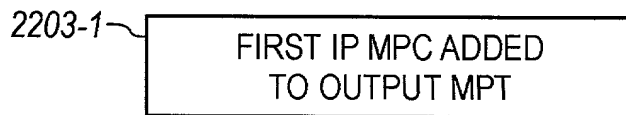
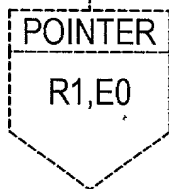
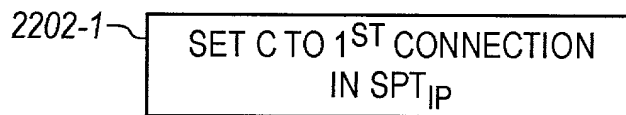
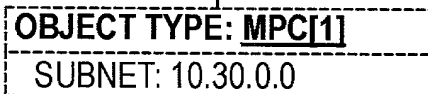
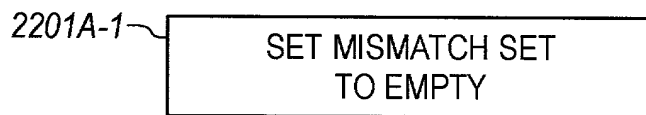
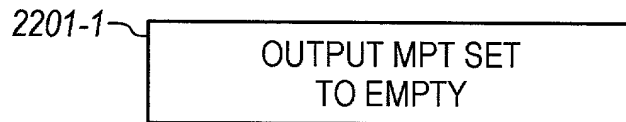


FIG. 24B



LOOPING THROUGH STEPS
 2203, 2204, 2205 ANOTHER IP
 MPC IS ADDED TO THE MPT

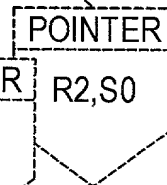
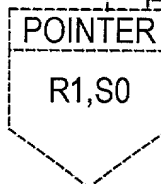
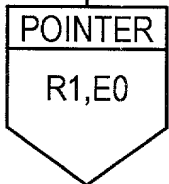
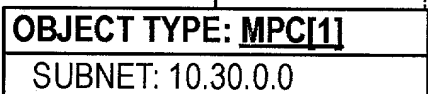


FIG. 24C

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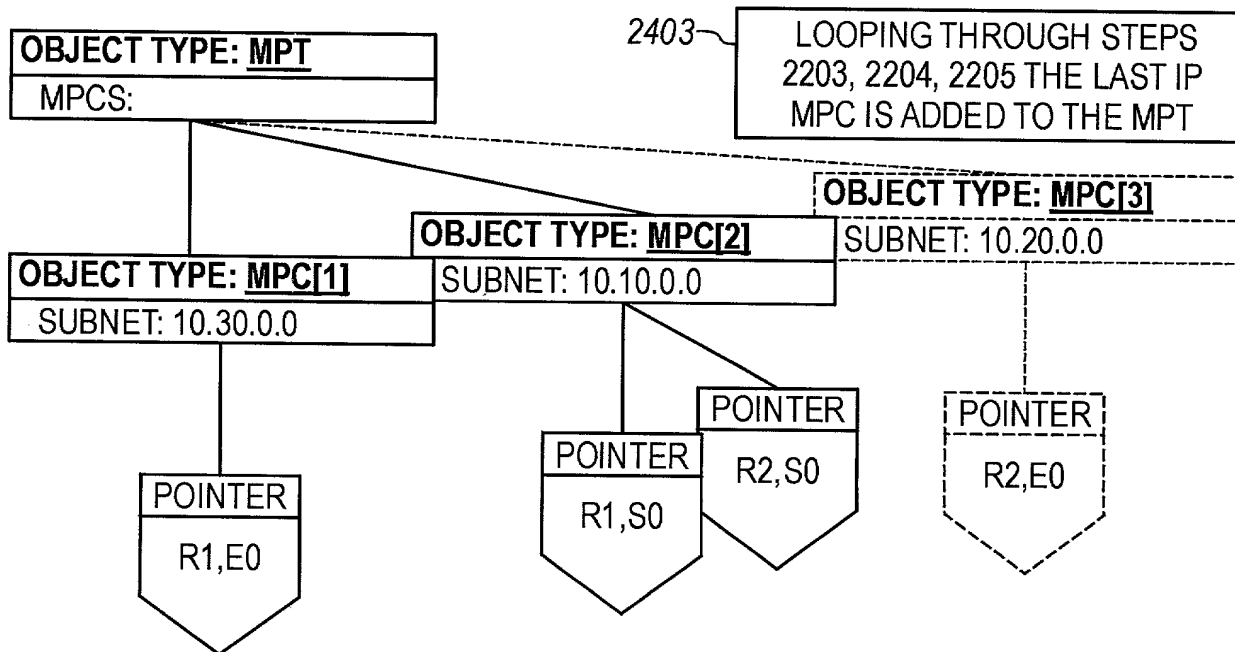


FIG. 24D

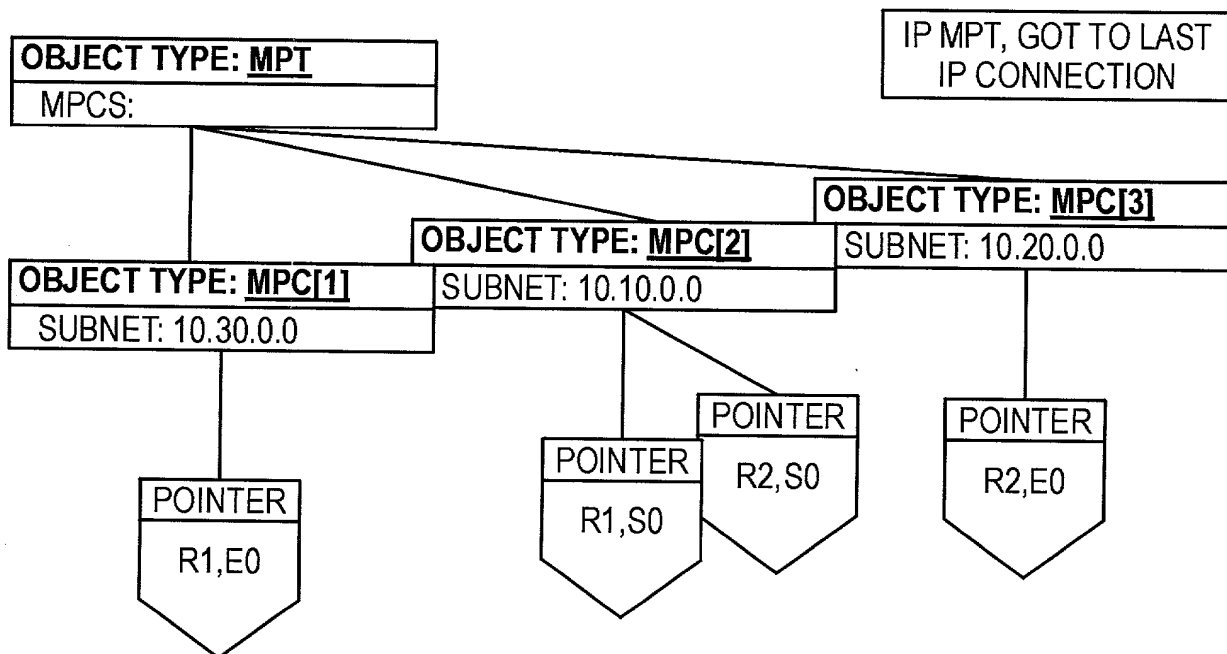


FIG. 24E

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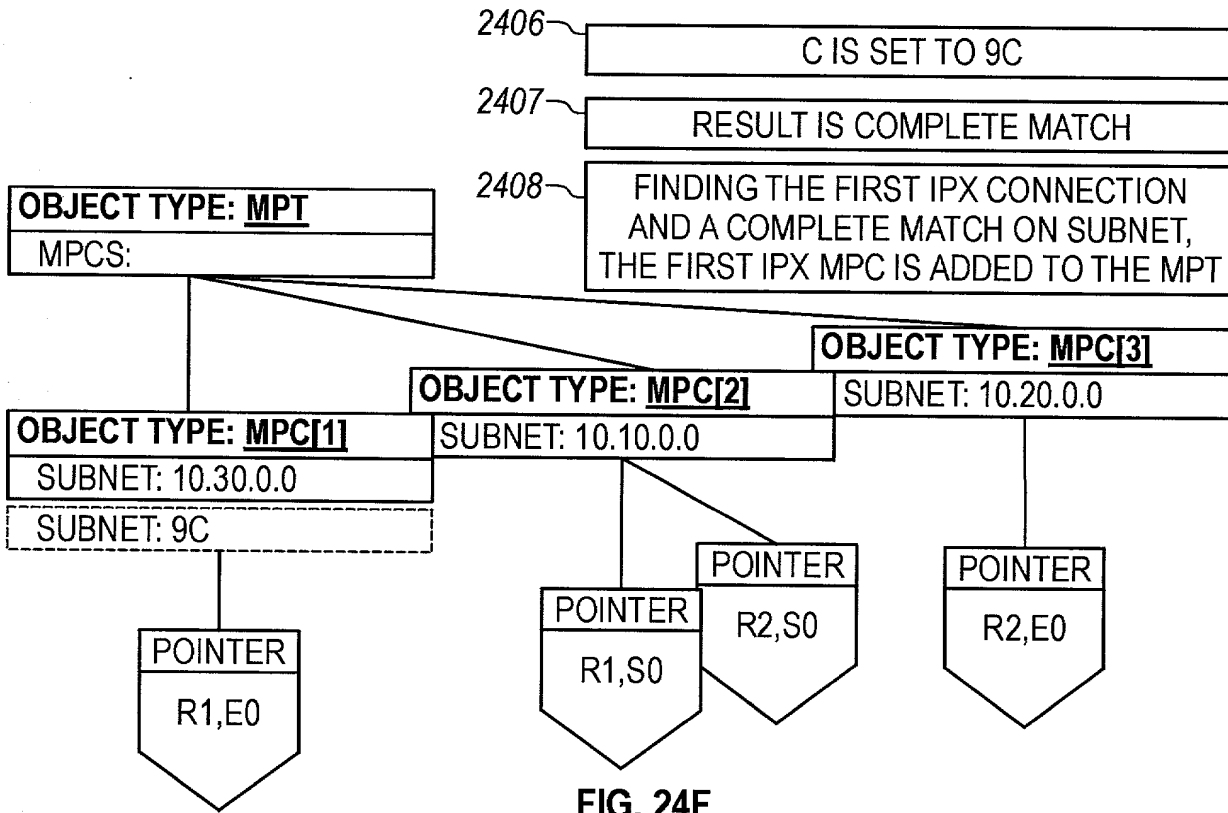


FIG. 24F

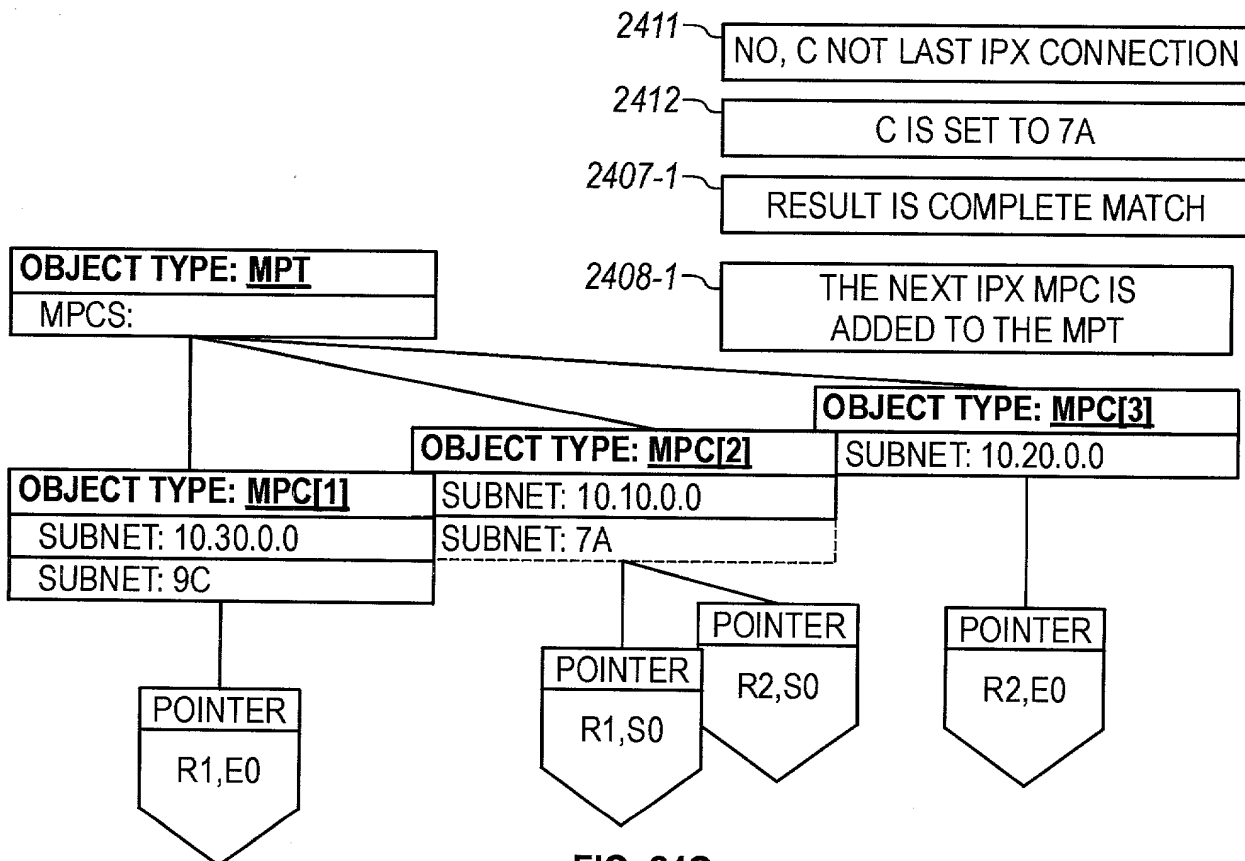


FIG. 24G

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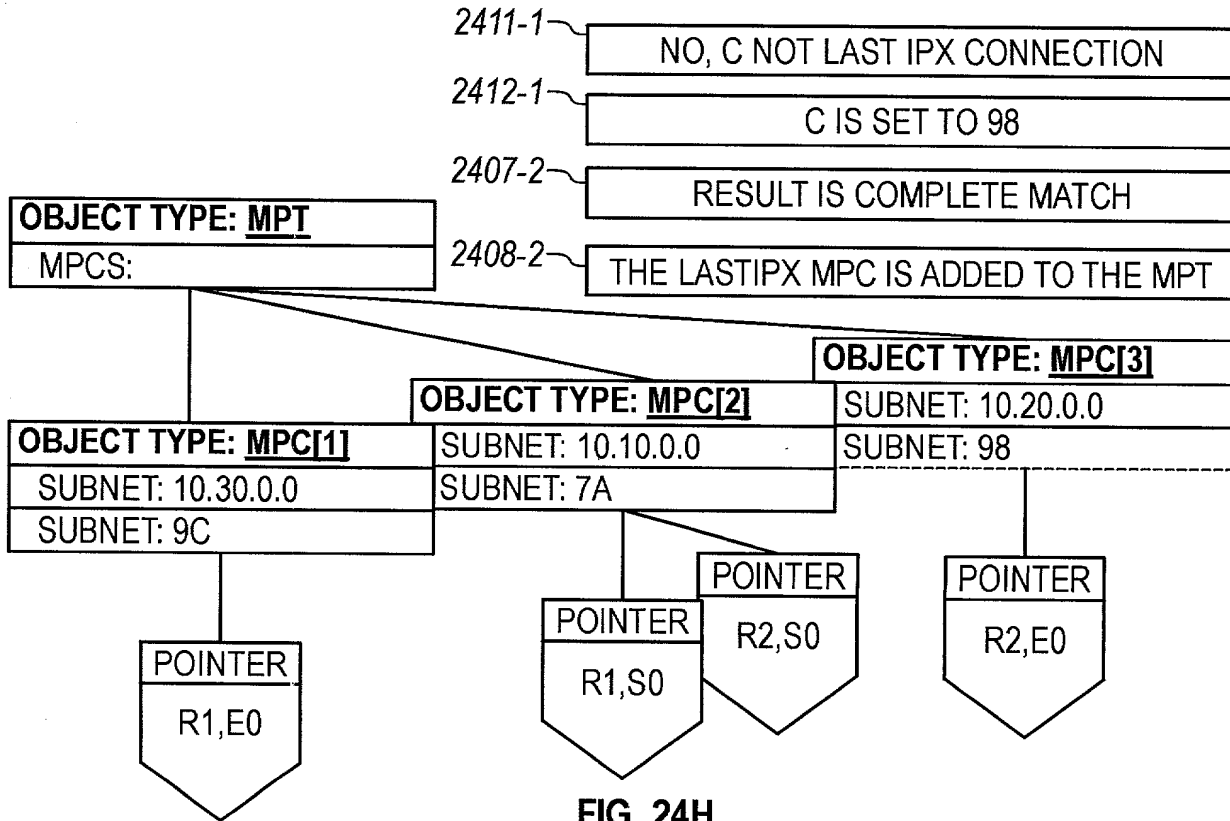


FIG. 24H

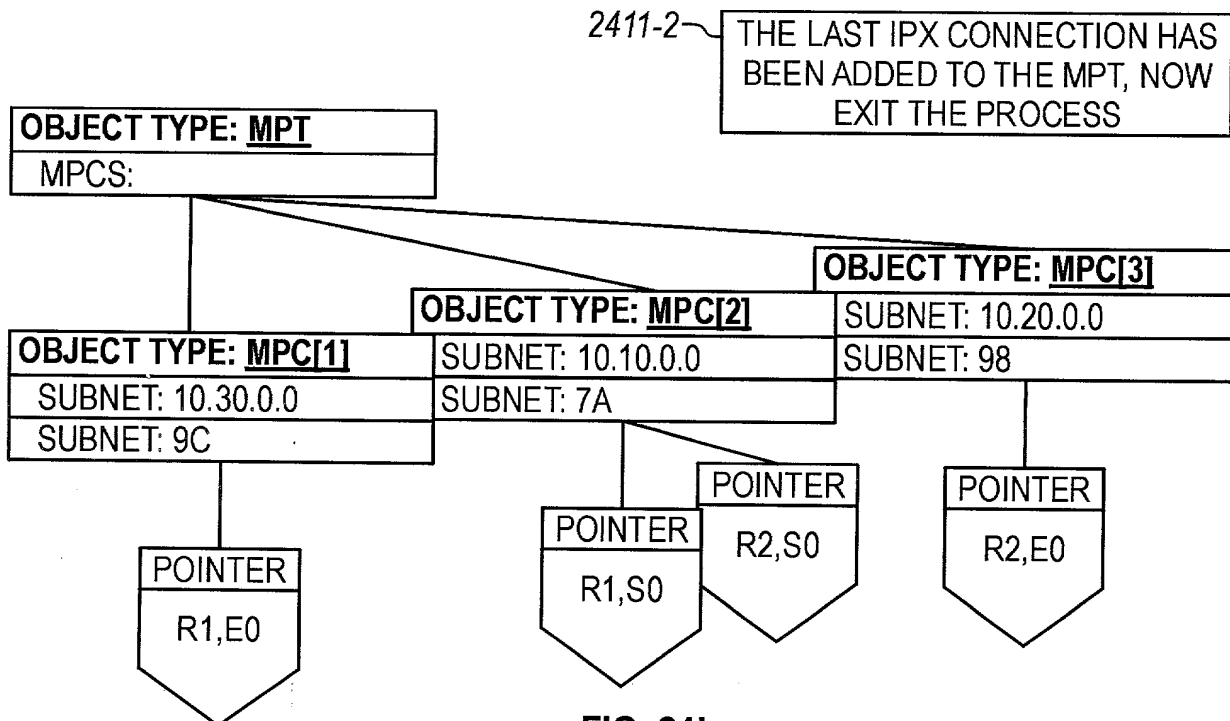


FIG. 24I

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MPT

OBJECT TYPE: <u>MPT</u>
MPCS:

OBJECT TYPE: <u>MPC</u>	SUBNET: 10.10.0.0	OBJECT TYPE: <u>MPC</u>	SUBNET: 10.20.0.0
SUBNET: 10.30.0.0	SUBNET: 7A	SUBNET: 98	
SUBNET: 9C			

SRO

OBJECT TYPE: <u>ROUTER(SRO)</u>
HOSTNAME: R1
PORTS •

PORT [1] E0
MEDIA TYPE: ETHERNET
NUMBER: 0
ENCAPSULATION: ARP
BANDWIDTH: 10000
DELAY: 100
PORT ADDRESSES •

PORT [2] S0
MEDIA TYPE: SERIAL
NUMBER: 0
ENCAPSULATION: HDLC
BANDWIDTH: 1544
DELAY: 2000
PORT ADDRESSES •

PORT_ADDR [1] (R1,E0,IP1)
PROTOCOL: IP
ADDR: 10.30.7.2 255.255.0.0

PORT_ADDR [2] (R1,S0,IP1)
PROTOCOL: IP
ADDR: 10.10.4.1 255.255.0.0

PORT_ADDR [1] (R1,E0,IPX1)
PROTOCOL: IPX
ADDR: 9C

PORT_ADDR [2] (R1,S0,IPX1)
PROTOCOL: IPX
ADDR: 7A

FIG. 25A

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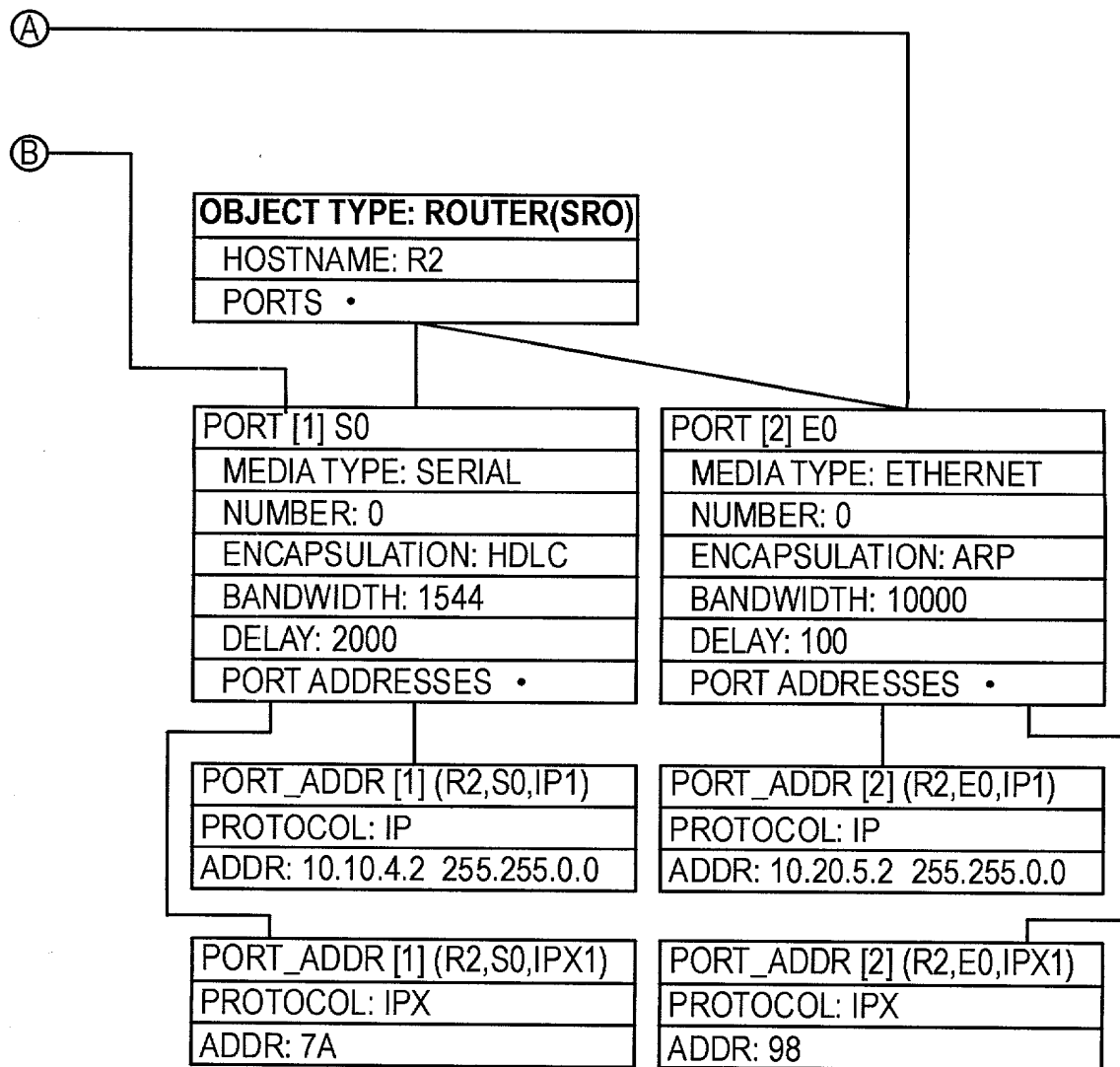


FIG. 25B

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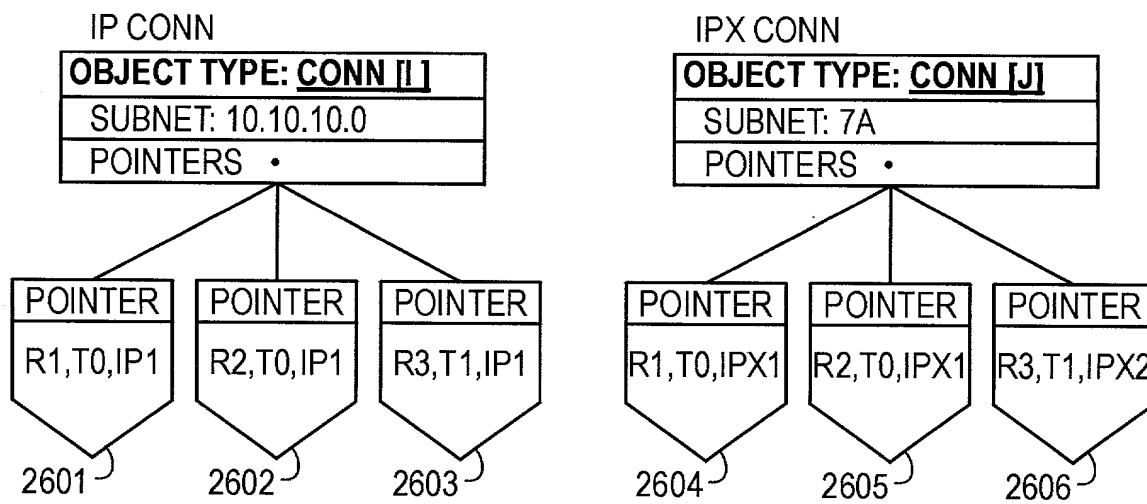
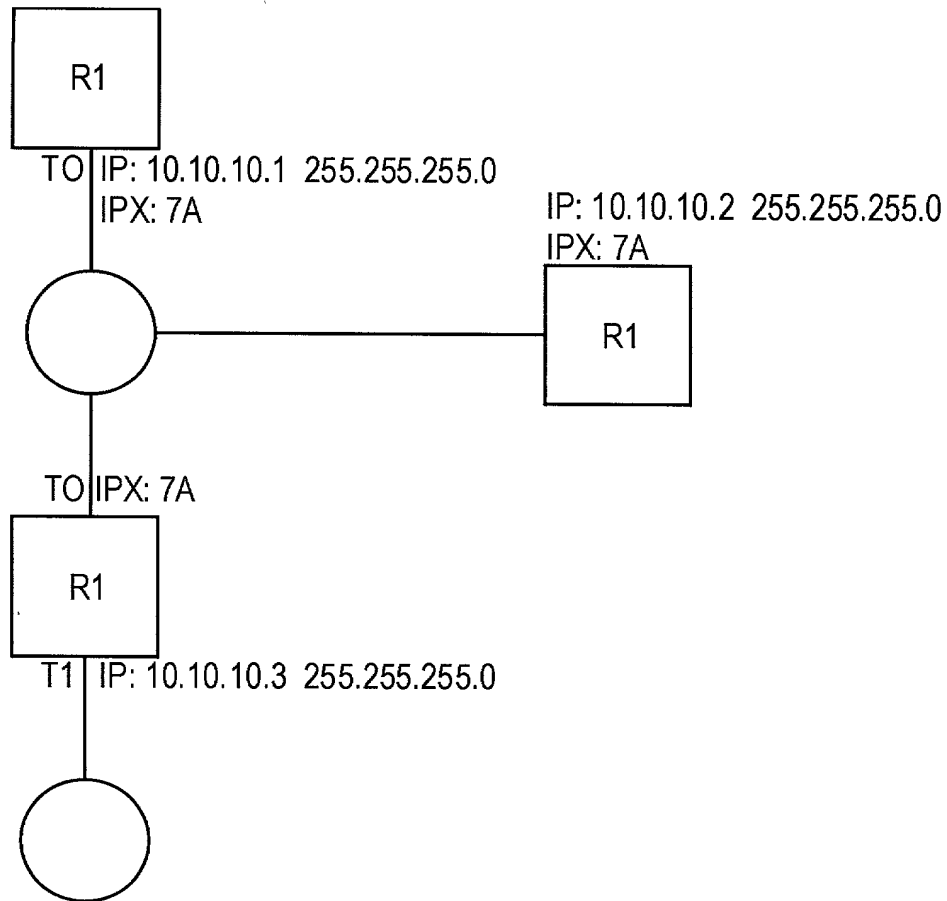


FIG. 26

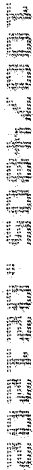
[illegible]

FIG. 27

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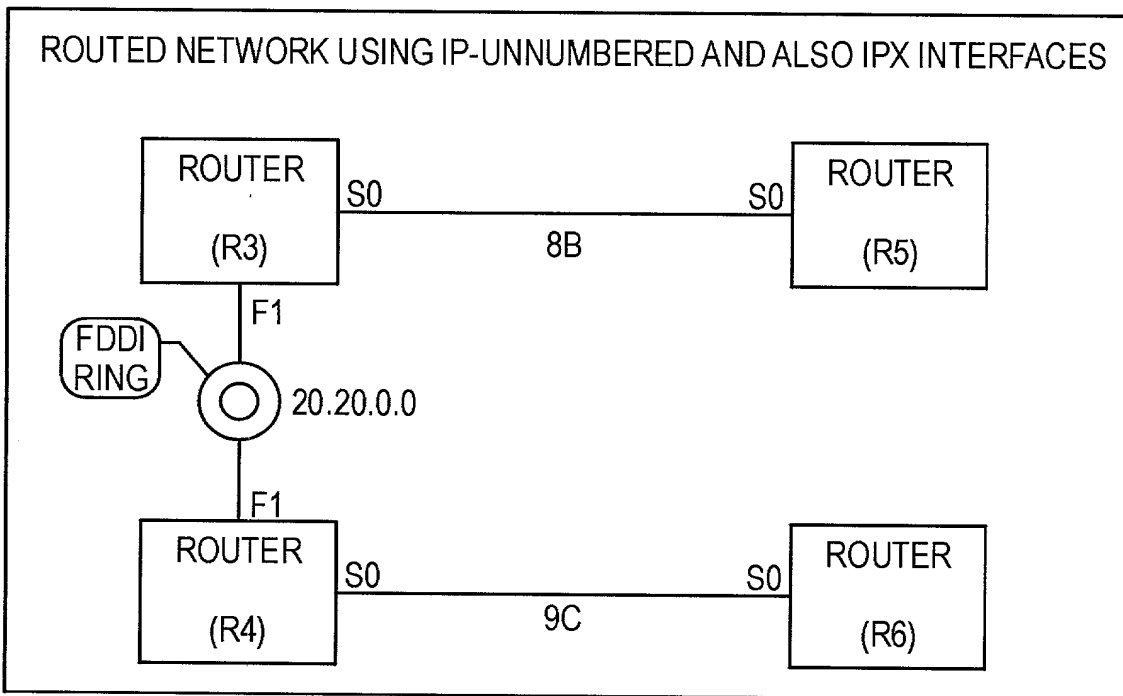


FIG. 28

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ROUTER R3:

2901

```
VERSION 10.0
!
HOSTNAME R3
!
NOVELL ROUTING 0000.0C08.94DD
!
INTERFACE LOOPBACK 1
IP ADDRESS 122.33.2.1 255.255.0.0

INTERFACE SERIAL0
IP-UNNUMBERED LOOPBACK 1
IPX NETWORK 8B
!
INTERFACE FDDI 0
IP ADDRESS 20.20.1.1 255.255.0.0
END
```

FIG. 29A

ROUTER R4:

```
VERSION 10.0
!
HOSTNAME R4
!
NOVELL ROUTING 0000.0C04.3A3E
!
INTERFACE LOOPBACK 1
IP ADDRESS 127.38.7.6 255.255.0.0

INTERFACE SERIAL0
IP-UNNUMBERED LOOPBACK 1
IPX NETWORK 9C
!
INTERFACE FDDI 0
IP ADDRESS 20.20.0.0 255.255.0.0
END
```

FIG. 29B

ROUTER R5:

```
VERSION 10.0
!
HOSTNAME R5
!
NOVELL ROUTING 0000.0D09.A5EE
!
INTERFACE LOOPBACK 1
IP ADDRESS 127.38.7.6 255.255.0.0

INTERFACE SERIAL0
IP-UNNUMBERED LOOPBACK 1
IPX NETWORK 8B
!
END
```

FIG. 29C

ROUTER R6:

```
VERSION 10.0
!
HOSTNAME R6
!
NOVELL ROUTING 0000.0D05.4B4F
!
INTERFACE LOOPBACK 1
IP ADDRESS 132.43.12.11 255.255.0.0

INTERFACE SERIAL0
IP-UNNUMBERED LOOPBACK 1
IPX NETWORK 9C
!
END
```

FIG. 29D

1004485 50325-0630

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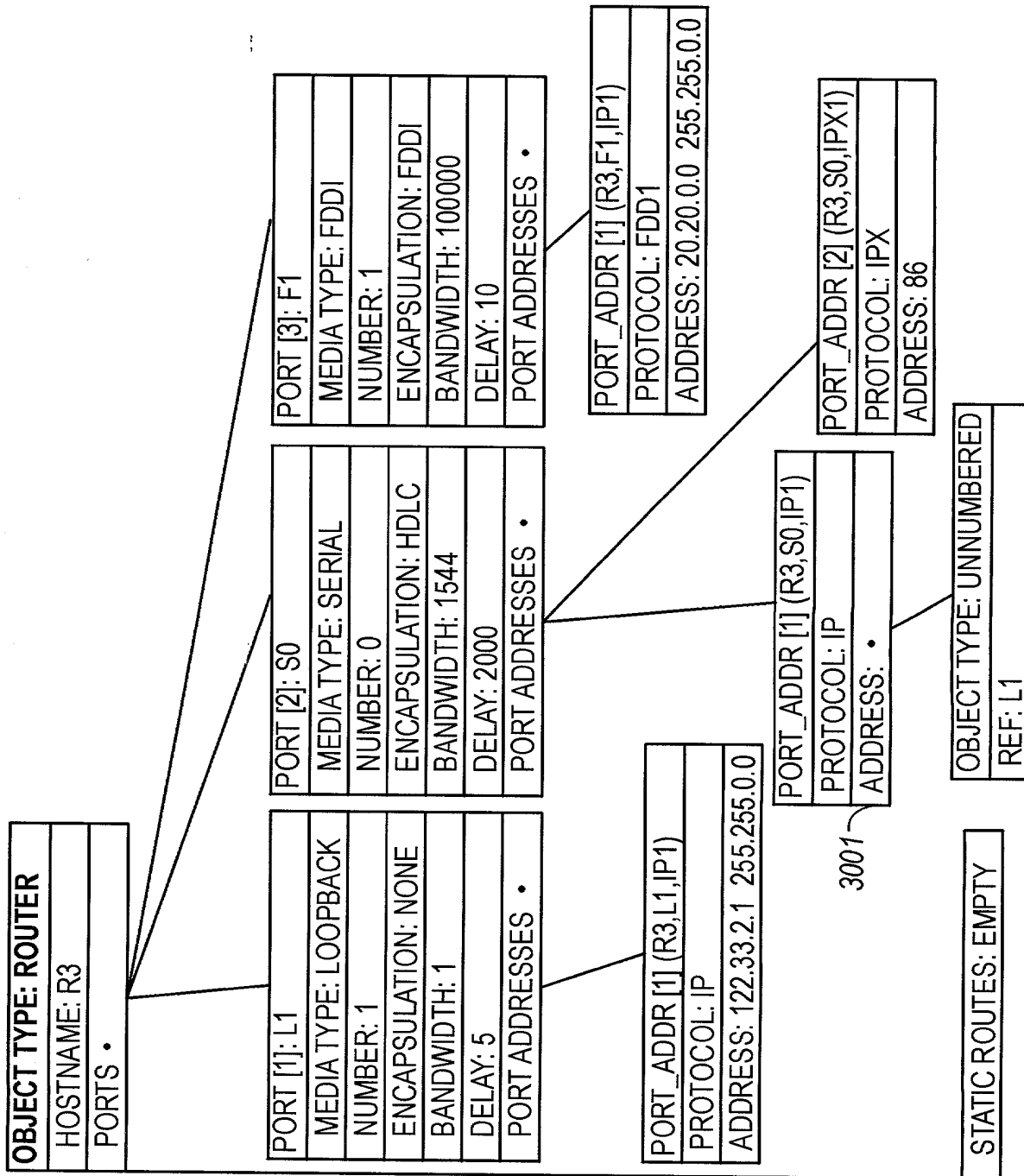


FIG. 30A

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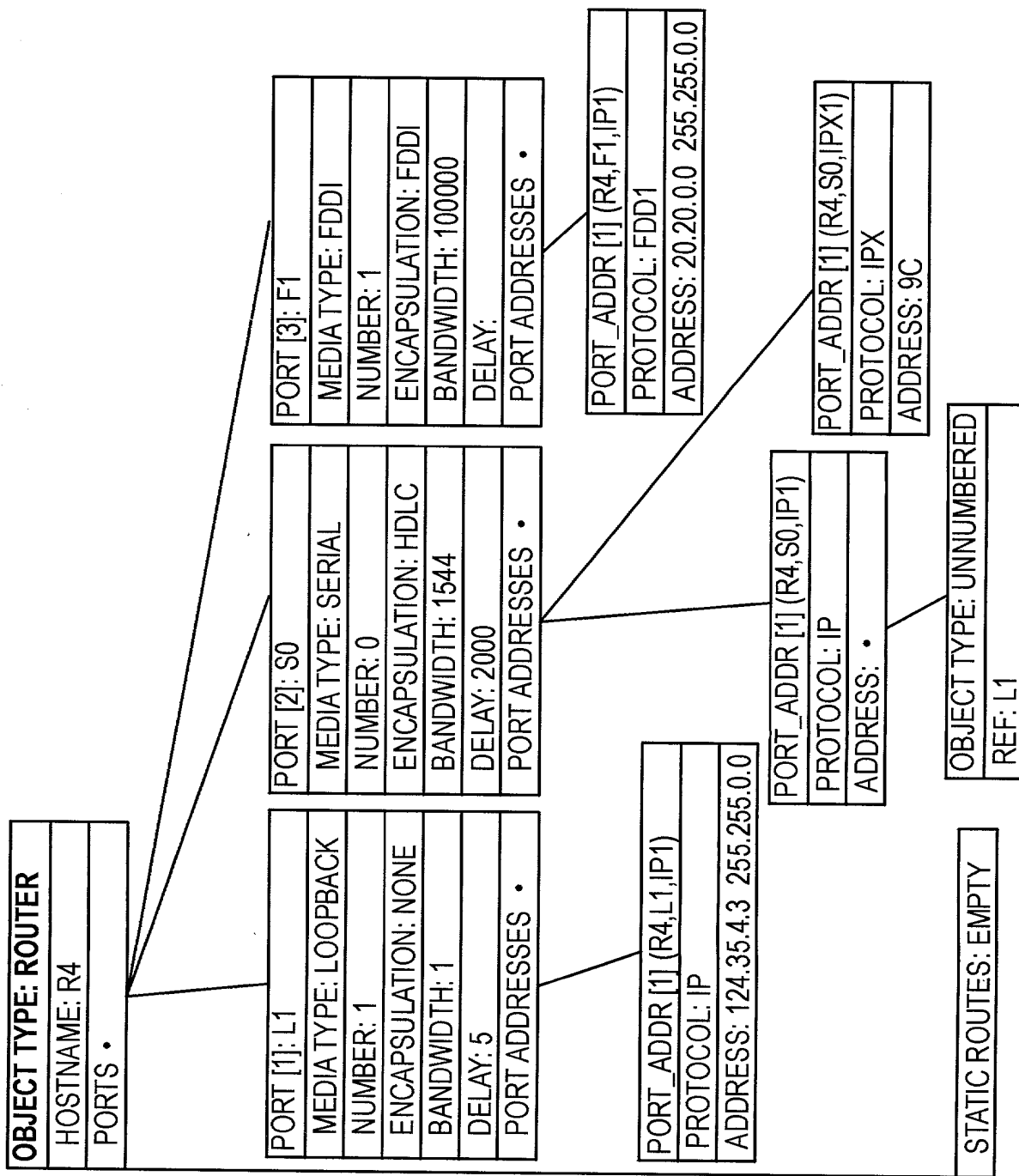


FIG. 30B

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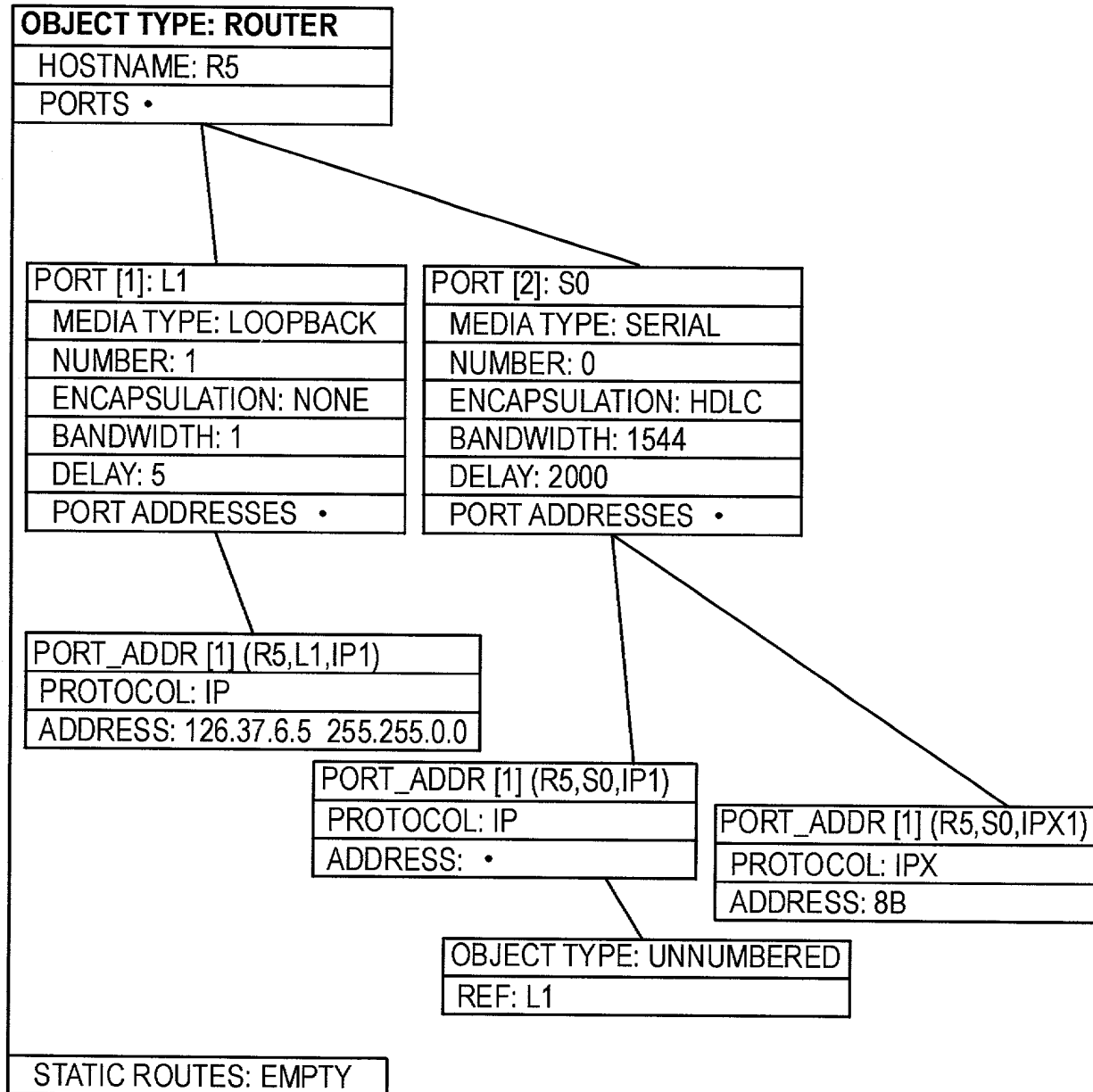


FIG. 30C

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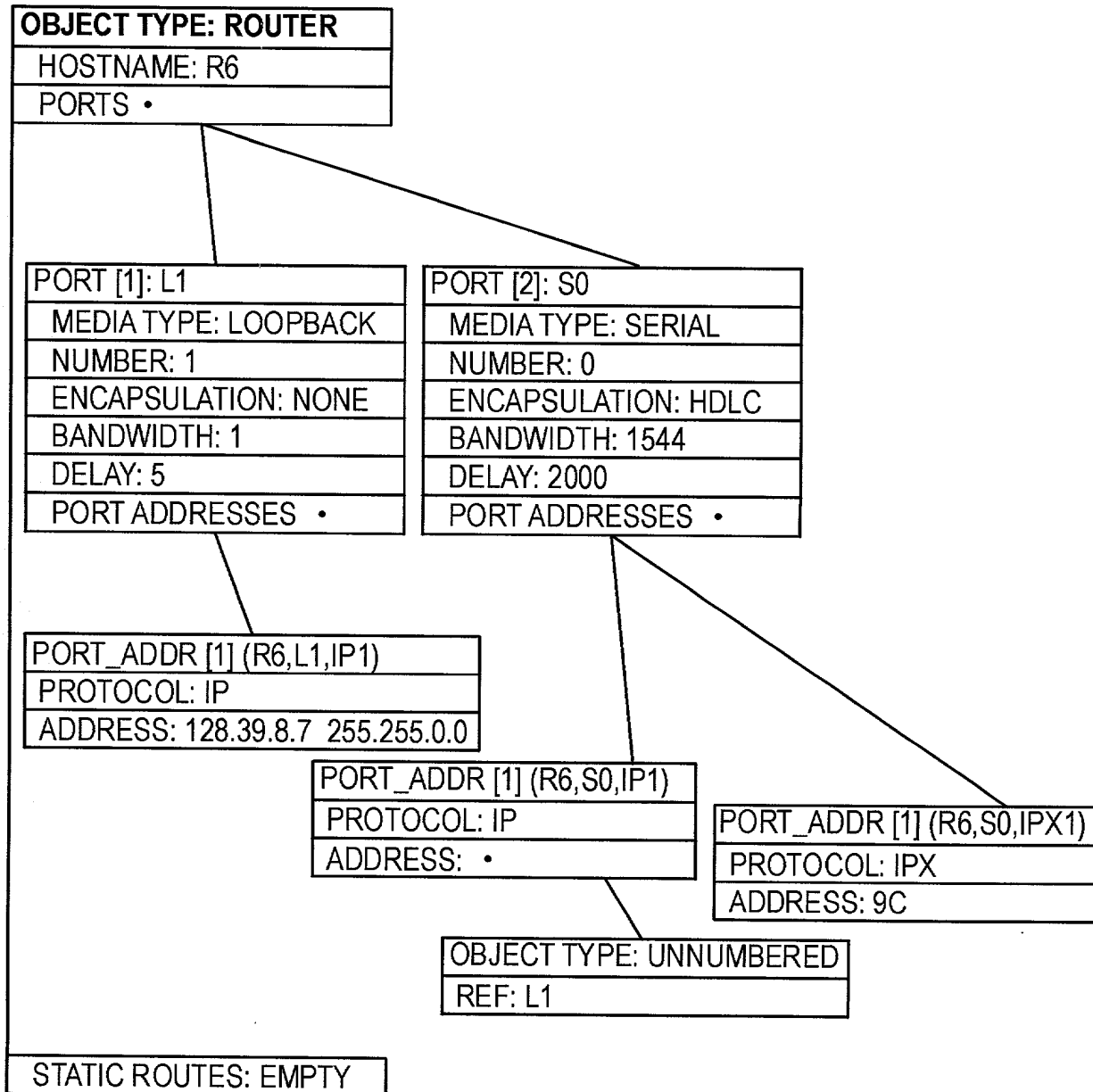


FIG. 30D

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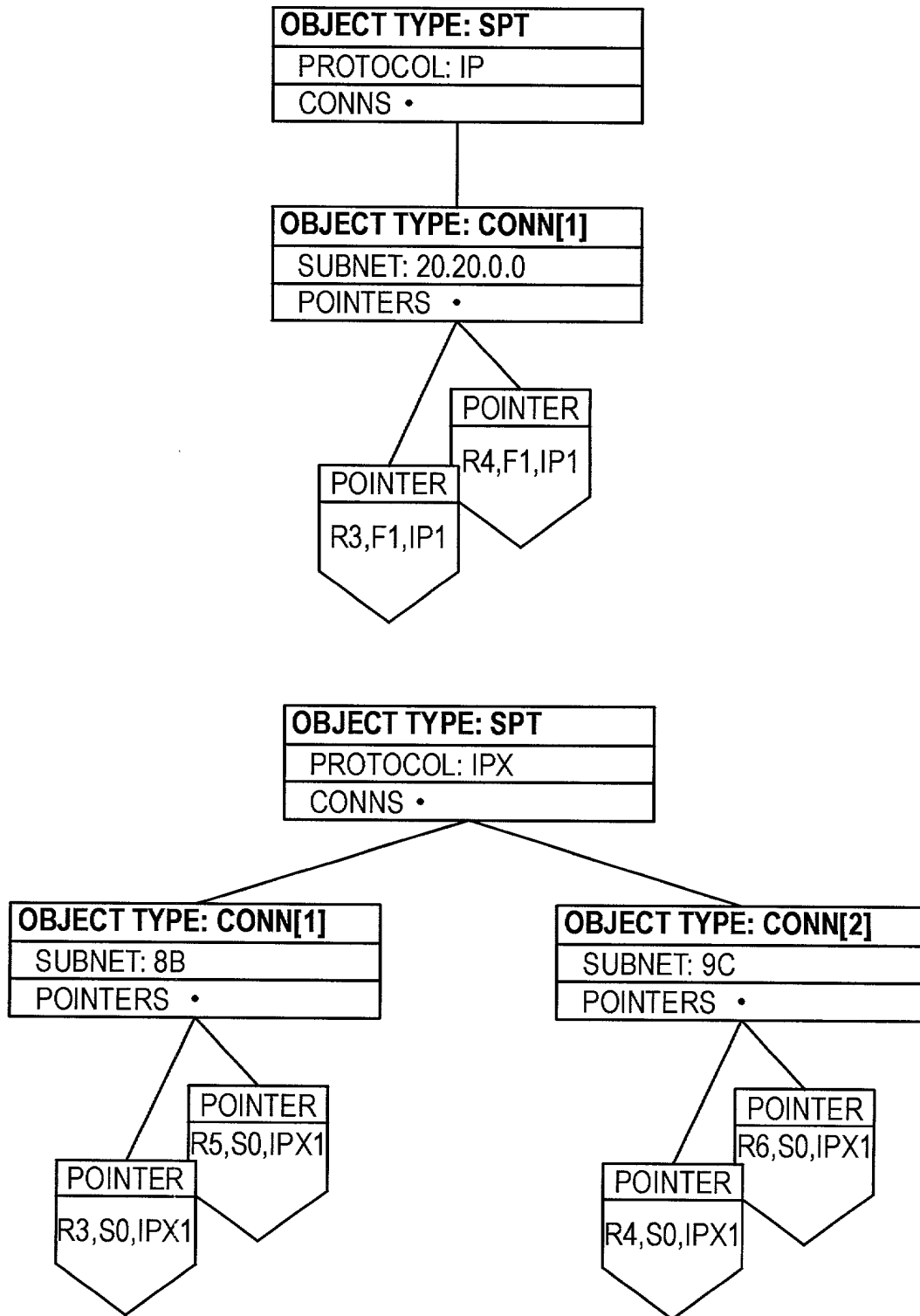


FIG. 30E

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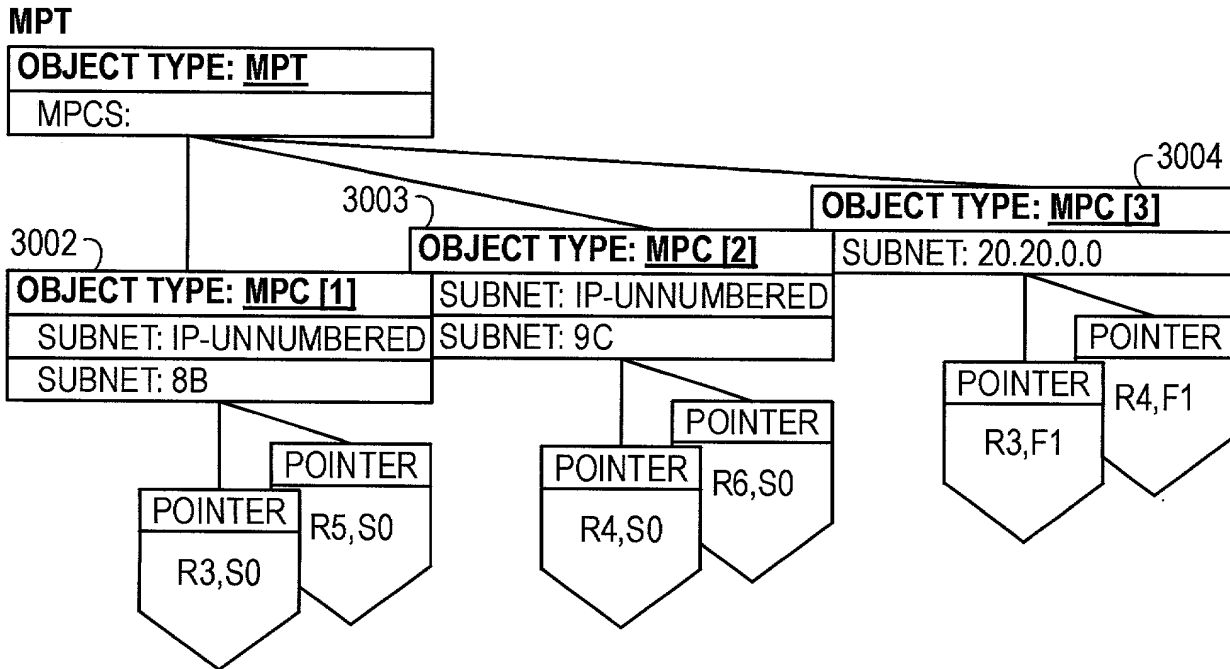


FIG. 30F

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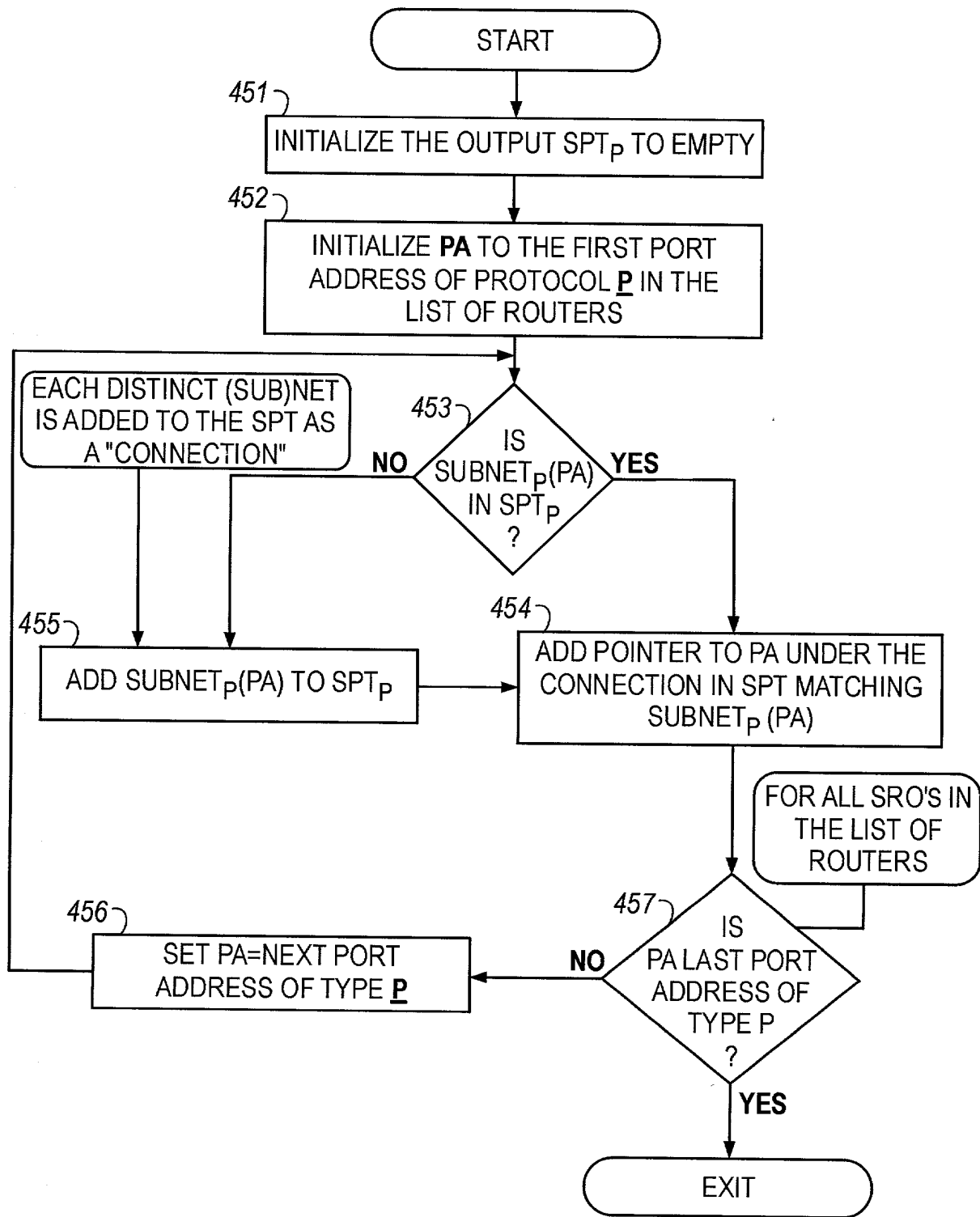


FIG. 31

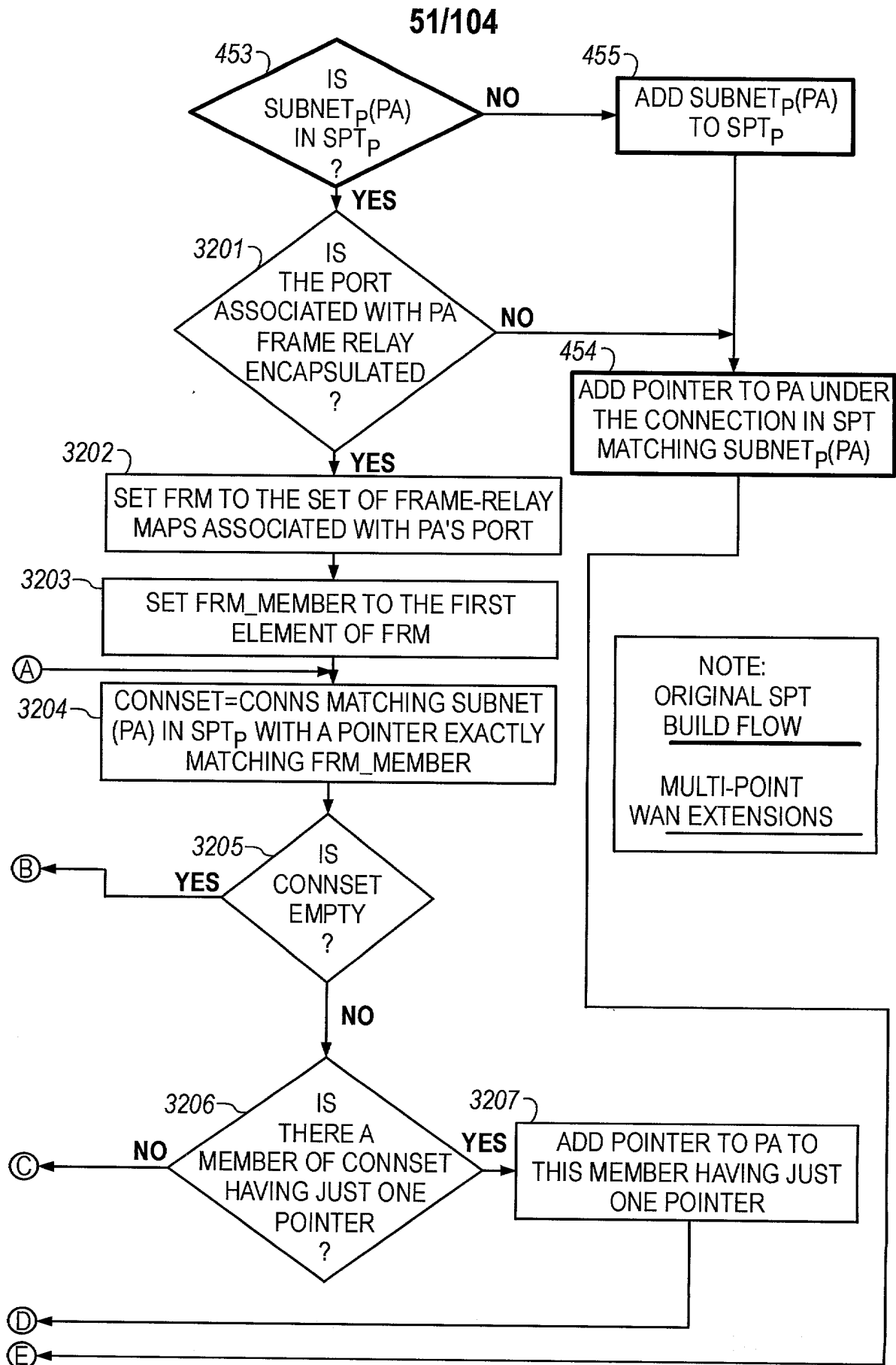


FIG. 32A

4004406 50342001

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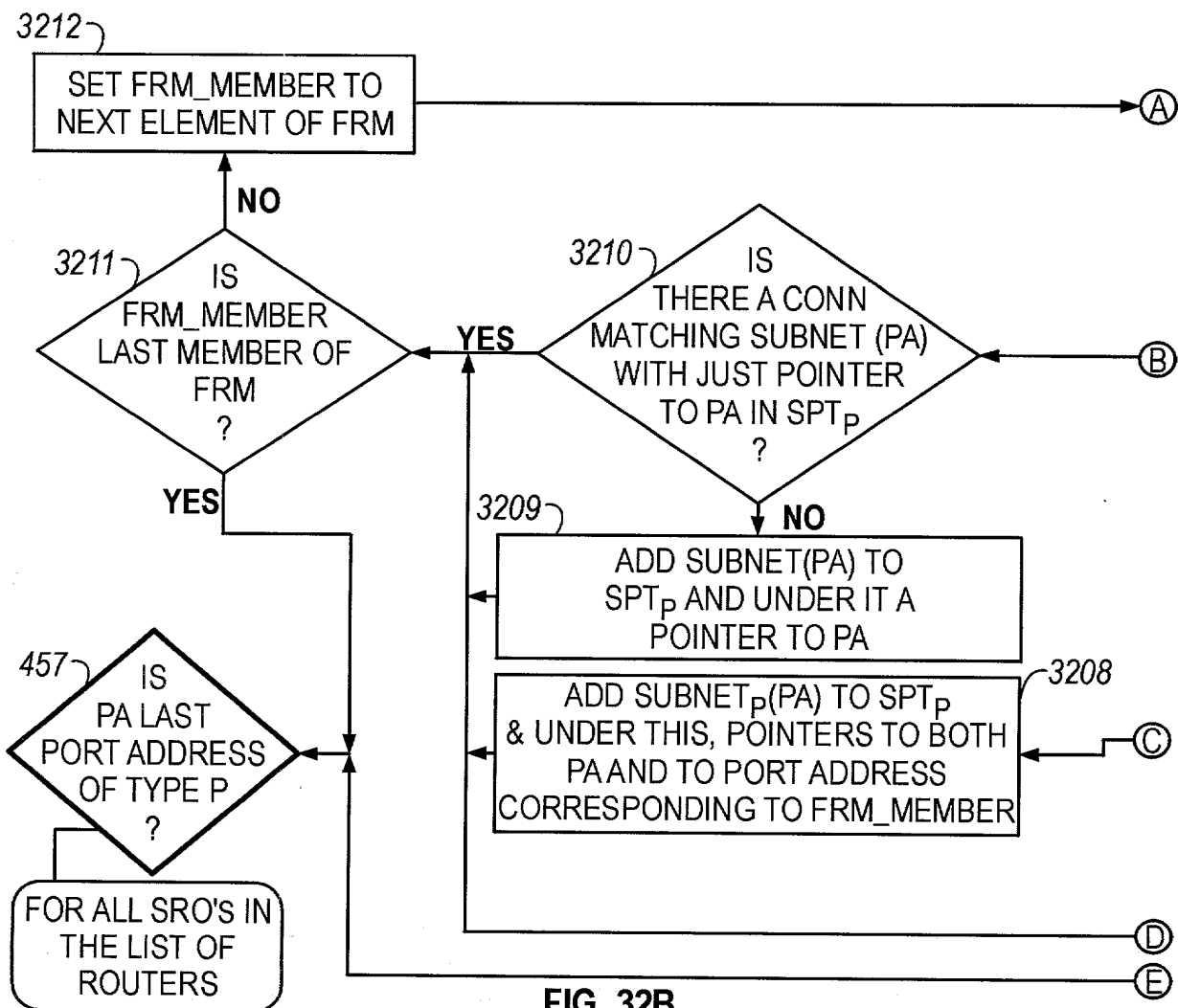


FIG. 32B

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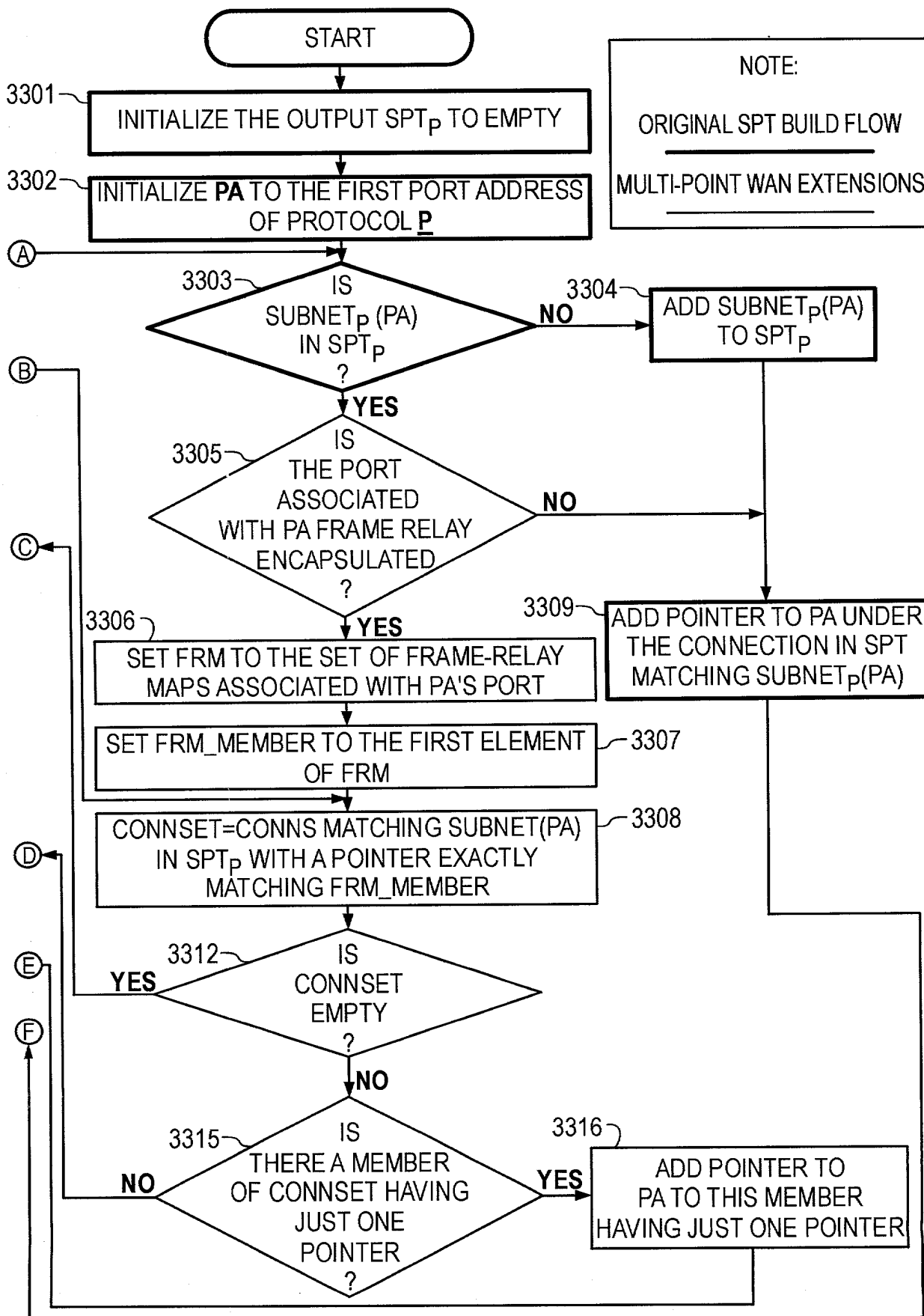


FIG. 33A

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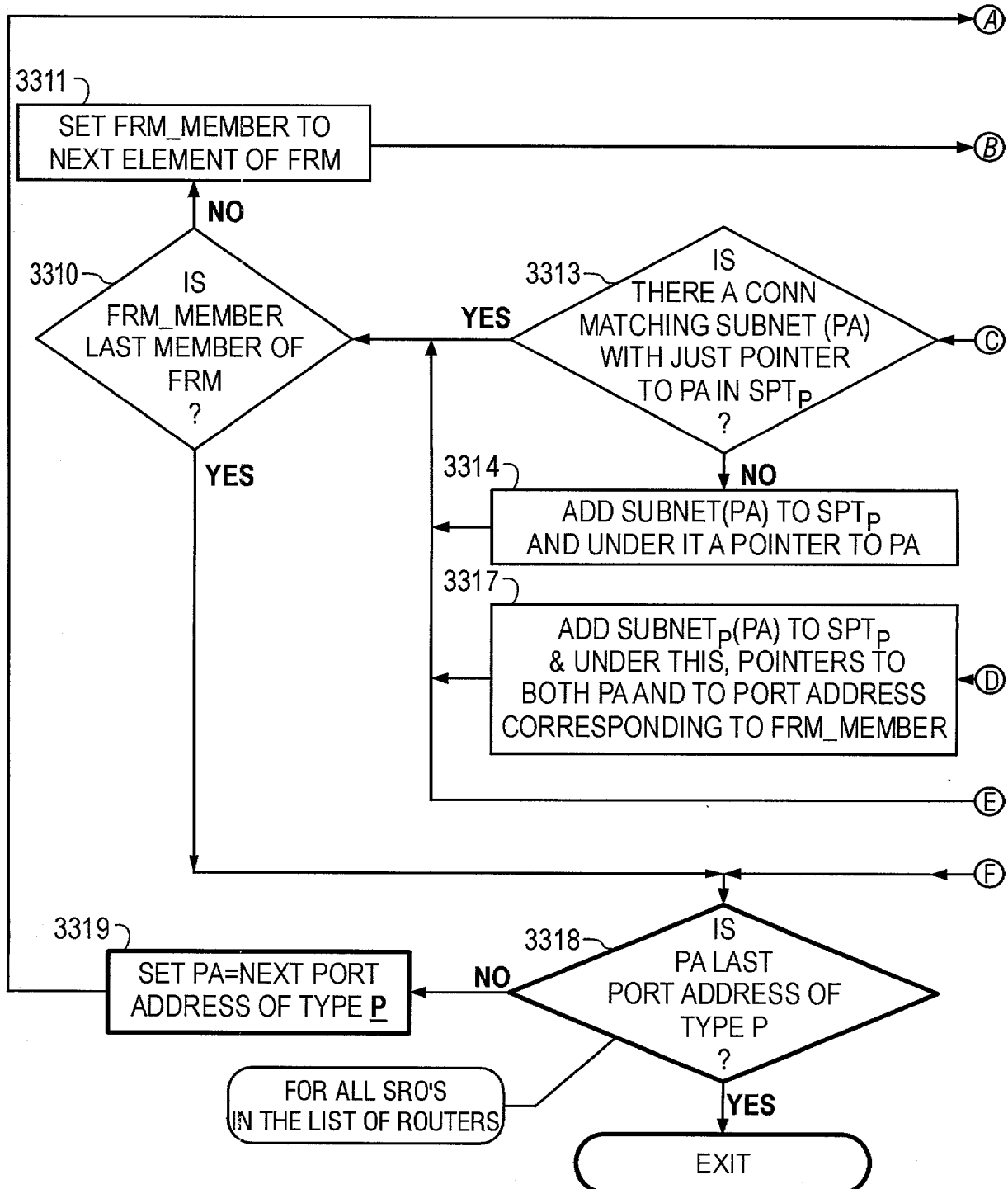


FIG. 33B

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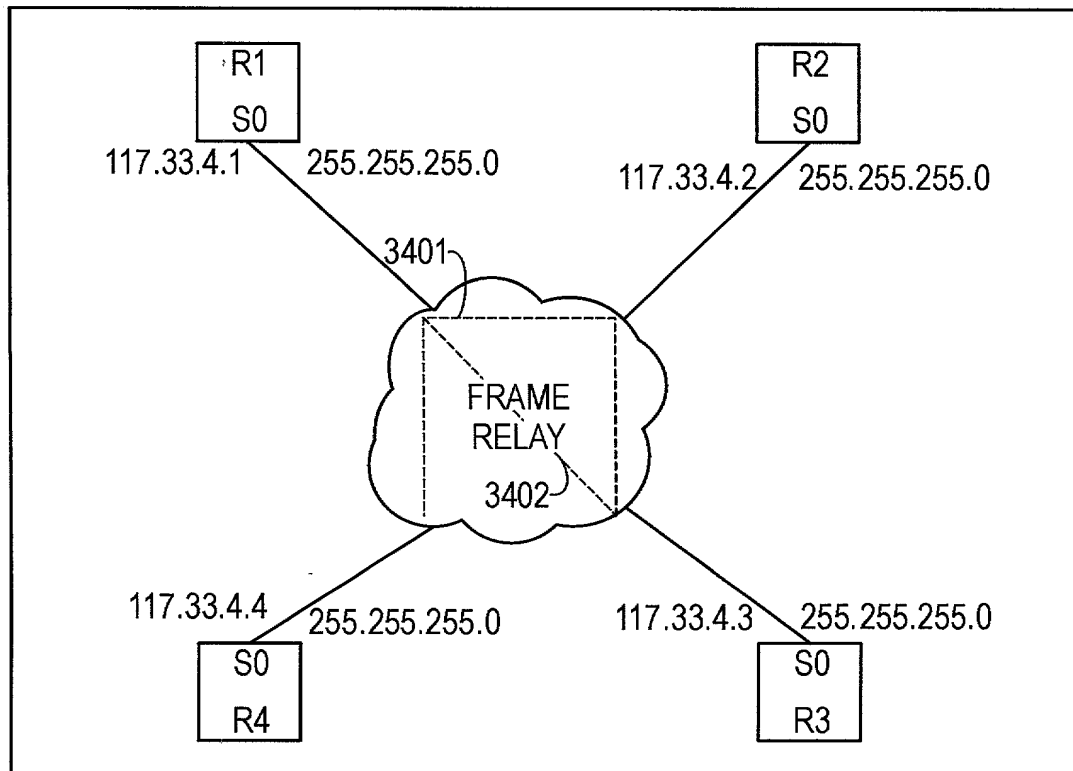


FIG. 34

NOTE TO FIGURE 34

THE NOTION OF A FRAME
RELAY CLOUD IMPLIES FULLY
MESHED CONNECTIVITY, YET
IN ACTUALITY CONNECTIVITY
MAY BE LIMITED AS SHOWN
WITH DOTTED LINES INSIDE
CLOUD

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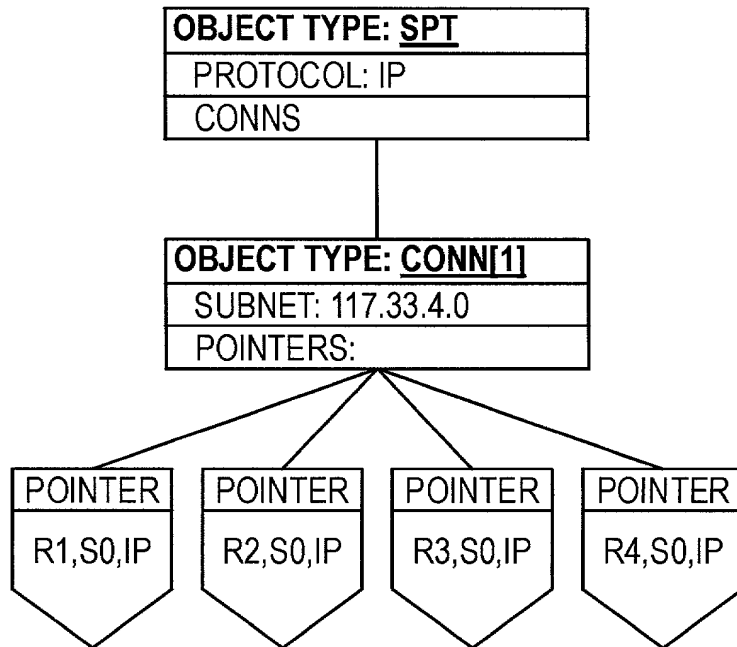


FIG. 35

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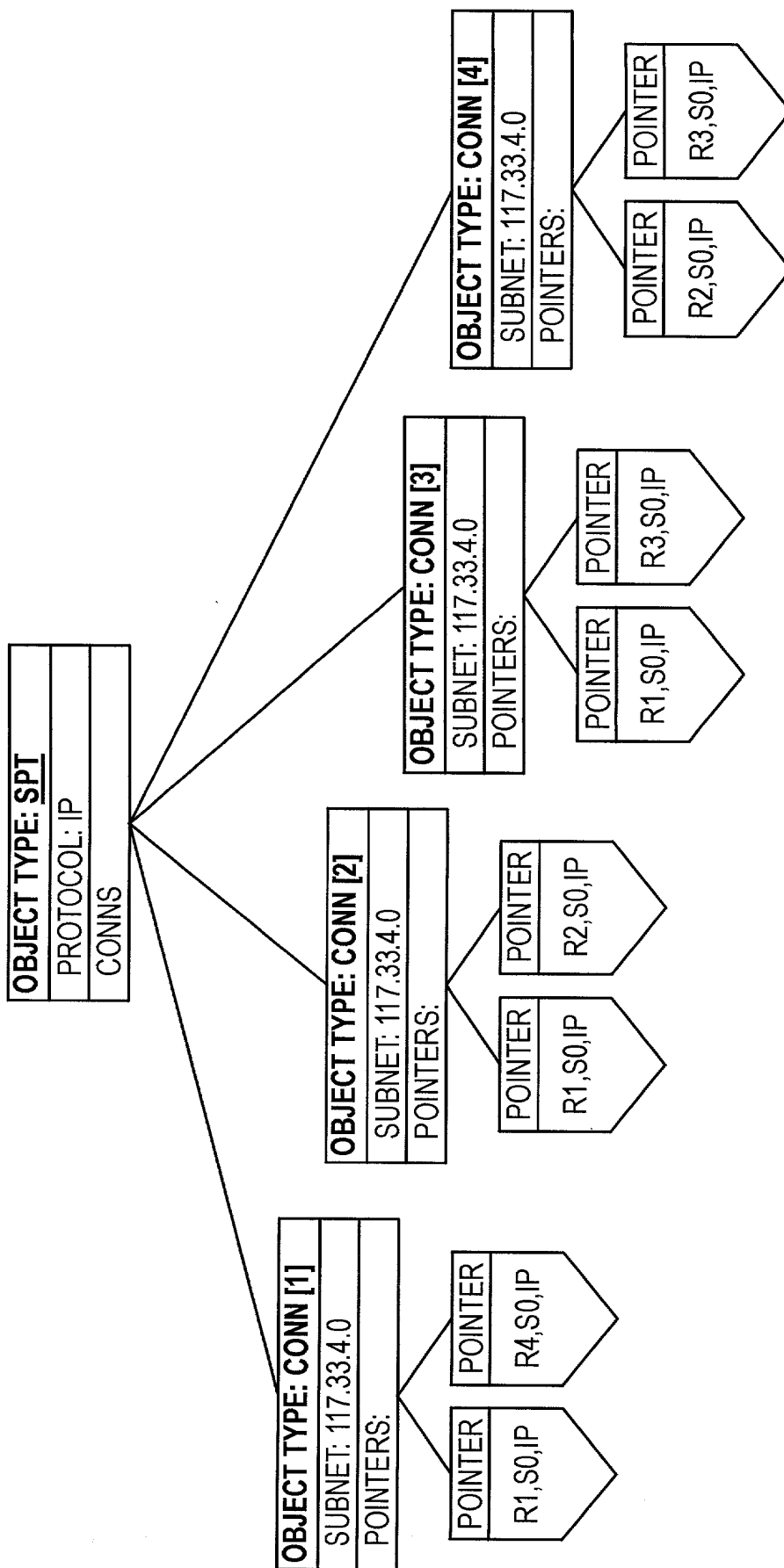


FIG. 36

202120 50812001

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OBJECT TYPE: ROUTER
HOSTNAME: R1
PORTS •

PORT [1]: S0
MEDIA TYPE: SERIAL
NUMBER: 0
ENCAP: FRAME RELAY
BANDWIDTH: 1544
DELAY: DEFAULT
PORT ADDRESSES:

PORT_ADDR [1] (R1,S0,IP1)
PROTOCOL: IP
ADDRESS: 117.33.4.1 255.255.0.0

FRAME MAPS •

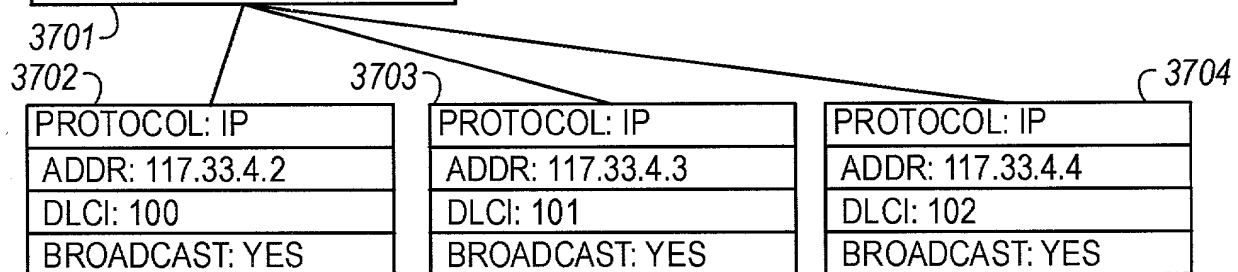


FIG. 37

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3801

```
VERSION 10.0
!  
HOSTNAME R1
!  
IP SUBNET-ZERO
!  
INTERFACE SERIAL0
DESCRIPTION SERIAL 0
ENCAPSULATION FRAME-RELAY
IP ADDRESS 117.33.4.1 255.255.0.0
FRAME RELAY MAP IP 117.33.4.2 100 BROADCAST
FRAME RELAY MAP IP 117.33.4.3 101 BROADCAST
FRAME RELAY MAP IP 117.33.4.4 102 BROADCAST
!  
ROUTER RIP 109
NETWORK 117.33.0.0
END
```

FIG. 38A

3803

```
VERSION 10.0
!  
HOSTNAME R2
!  
IP SUBNET-ZERO
!  
INTERFACE SERIAL0
DESCRIPTION SERIAL 0
ENCAPSULATION FRAME-RELAY
IP ADDRESS 117.33.4.1 255.255.0.0
FRAME RELAY MAP IP 117.33.4.1 100 BROADCAST
FRAME RELAY MAP IP 117.33.4.3 101 BROADCAST
!  
ROUTER RIP 109
NETWORK 117.33.0.0
END
```

FIG. 38B

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VERSION 10.0
!
HOSTNAME R3
!
IP SUBNET-ZERO
!
INTERFACE SERIAL0
DESCRIPTION SERIAL 0
ENCAPSULATION FRAME-RELAY
IP ADDRESS 117.33.4.1 255.255.0.0
FRAME RELAY MAP IP 117.33.4.1 100 BROADCAST
FRAME RELAY MAP IP 117.33.4.2 101 BROADCAST
!
ROUTER RIP 109
NETWORK 117.33.0.0
END

FIG. 38C

VERSION 10.0
!
HOSTNAME R4
!
IP SUBNET-ZERO
!
INTERFACE SERIAL0
DESCRIPTION SERIAL 0
ENCAPSULATION FRAME-RELAY
IP ADDRESS 117.33.4.1 255.255.0.0
FRAME RELAY MAP IP 117.33.4.1 100 BROADCAST
!
ROUTER RIP 109
NETWORK 117.33.0.0
END

FIG. 38D

10074805-021202

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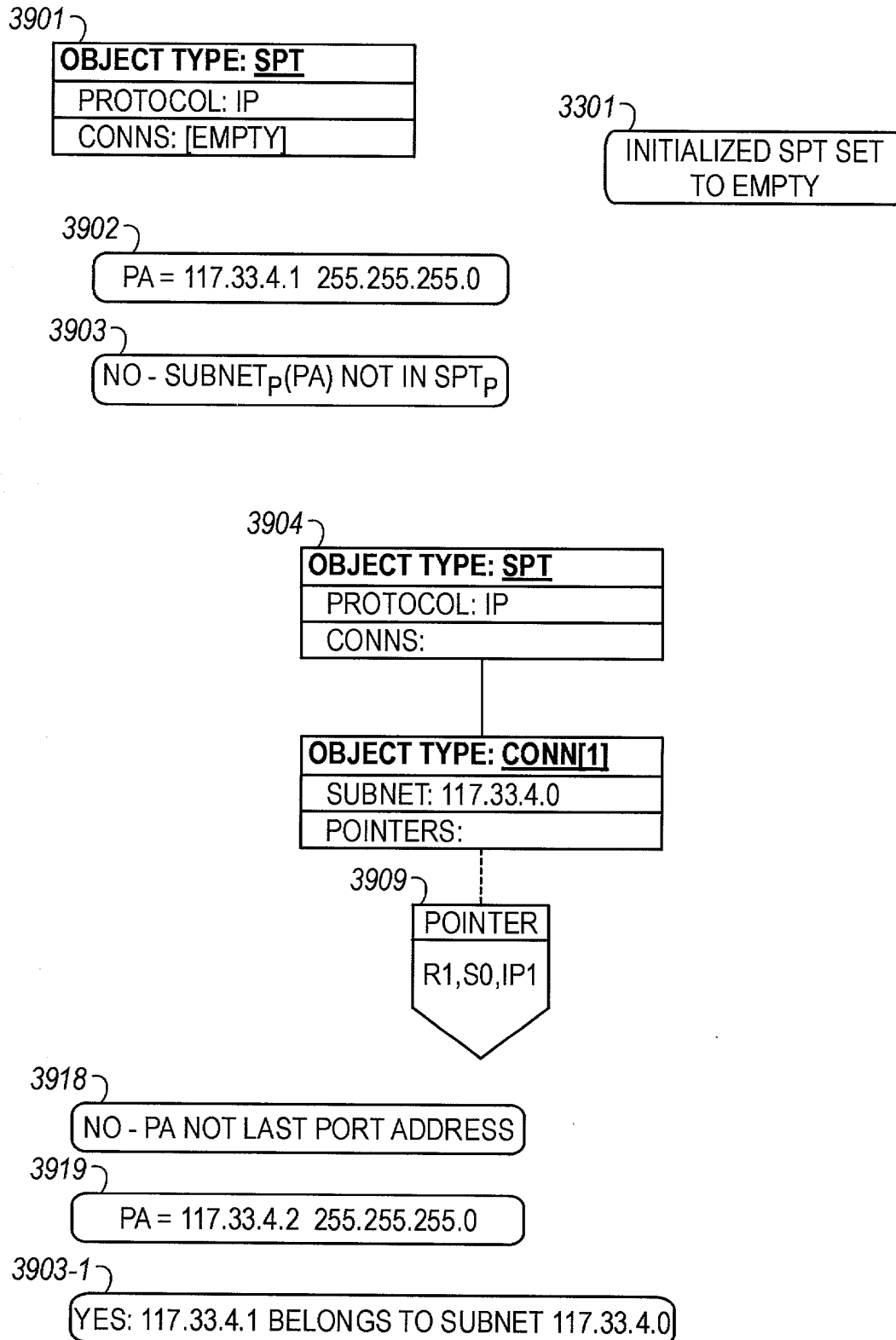


FIG. 39A

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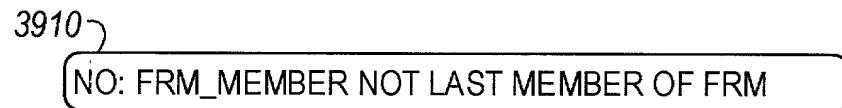
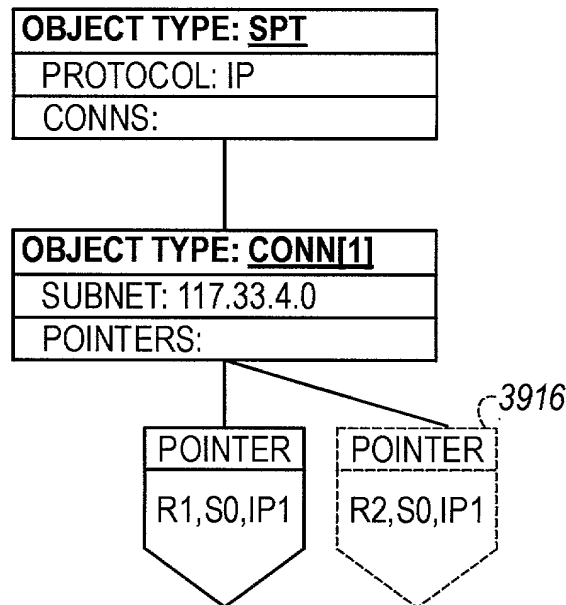
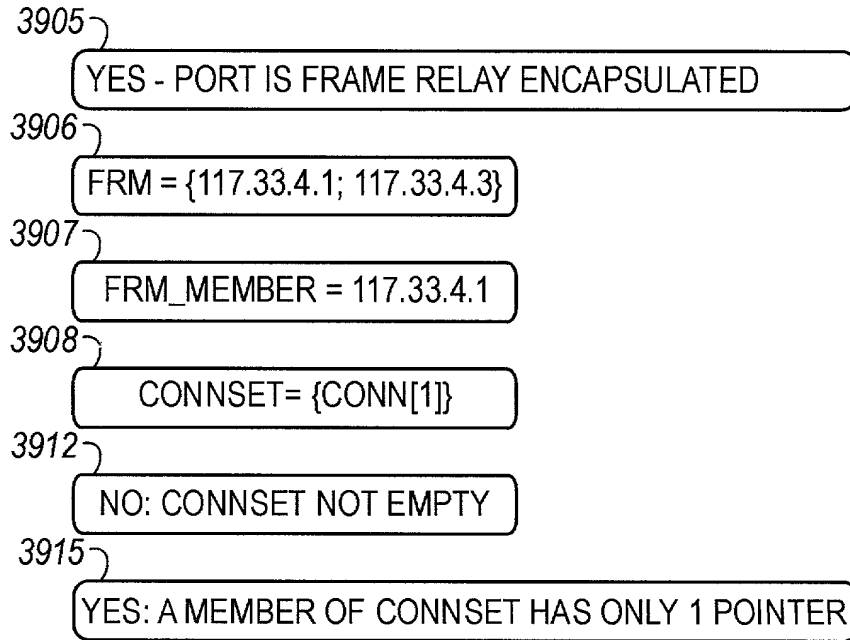


FIG. 39B

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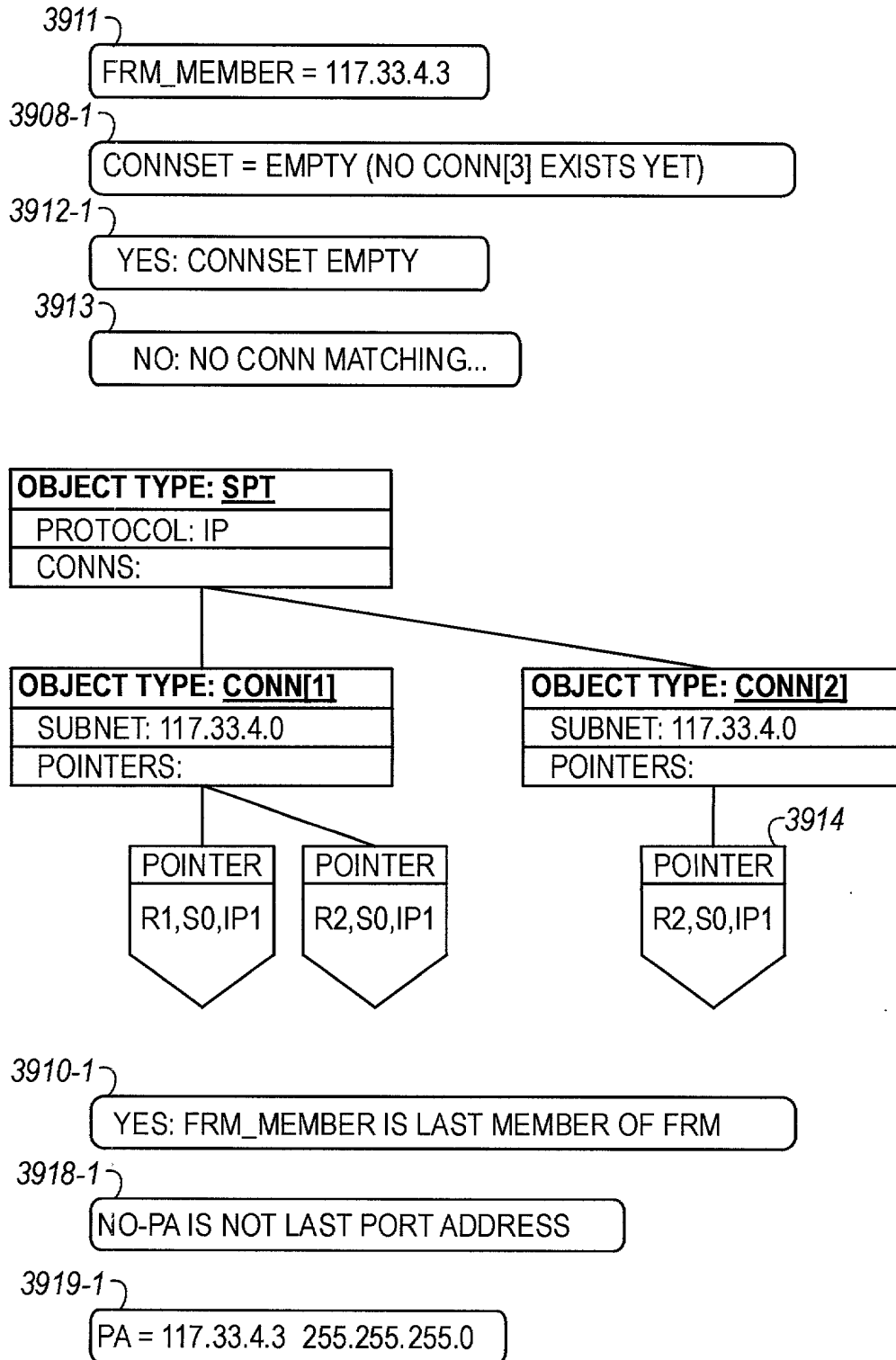


FIG. 39C

202120 50342001

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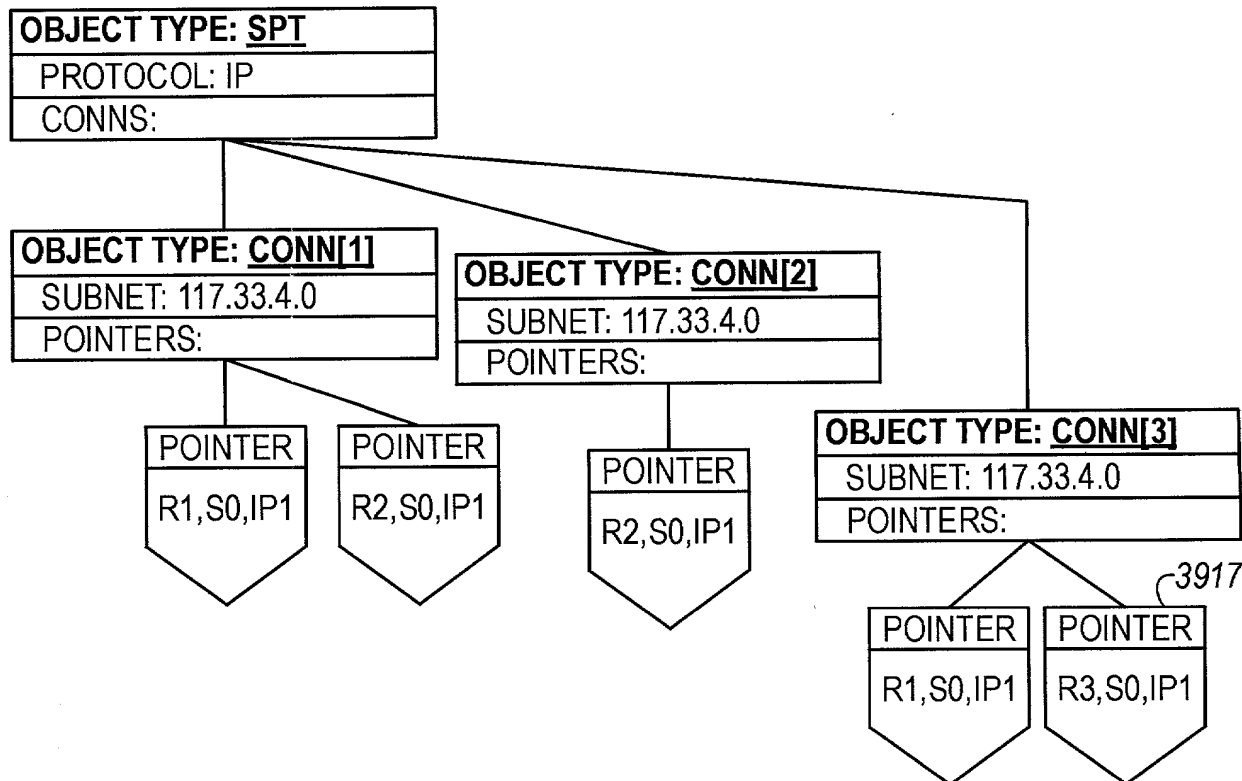
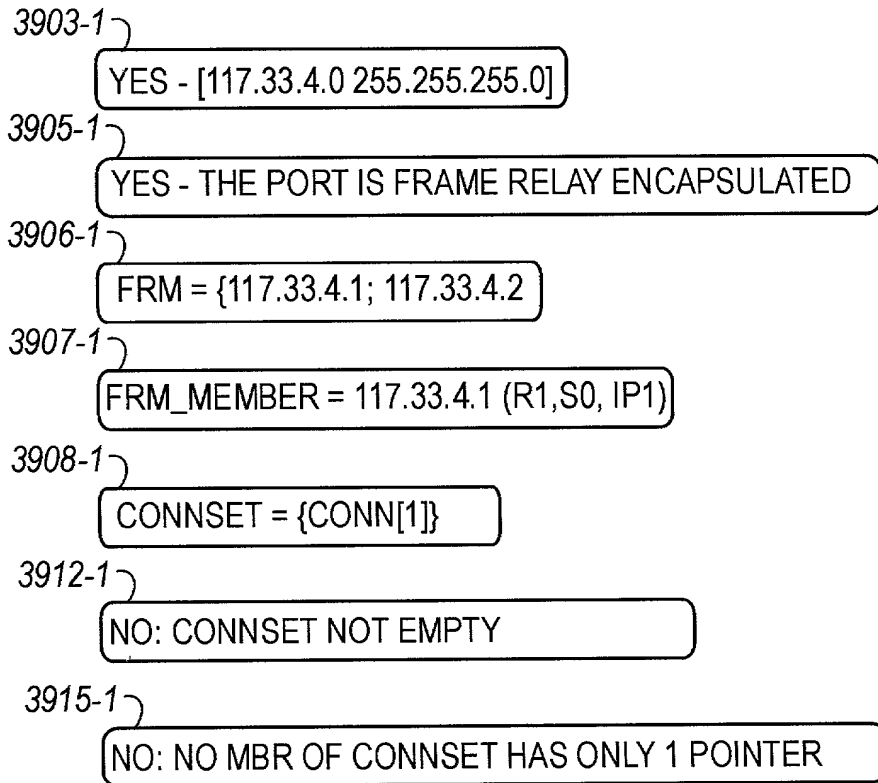


FIG. 39D

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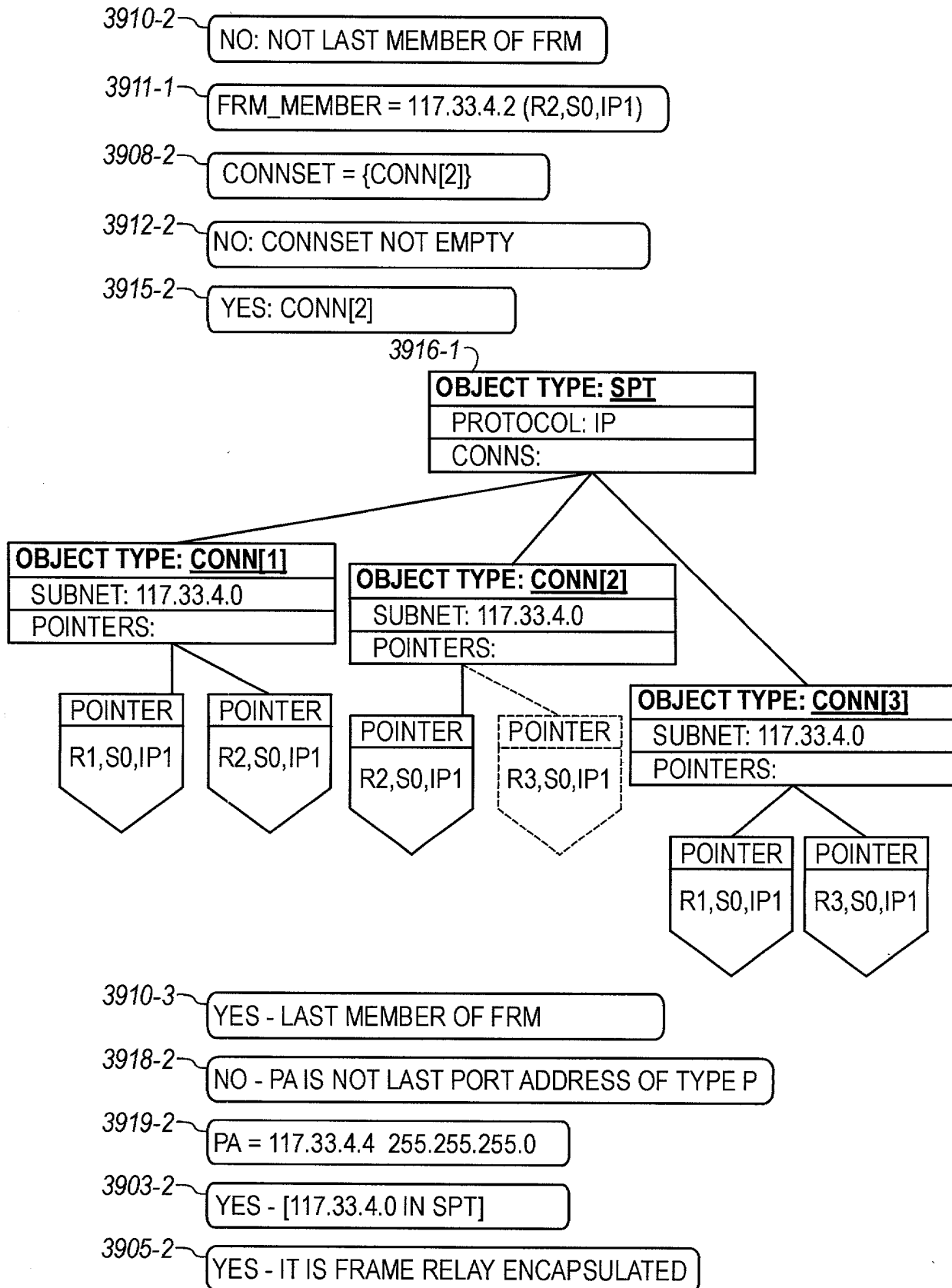


FIG. 39E

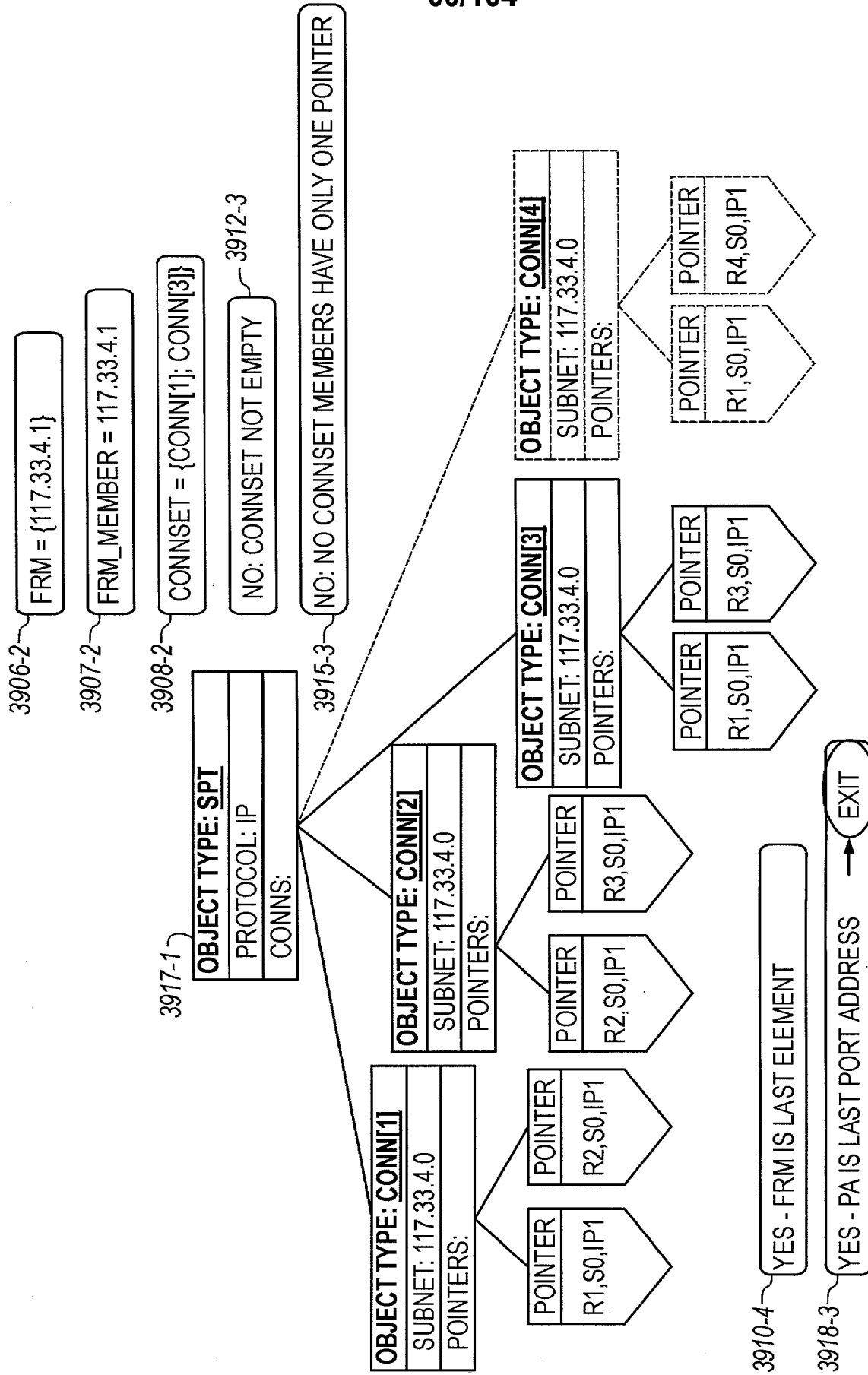


FIG. 39F

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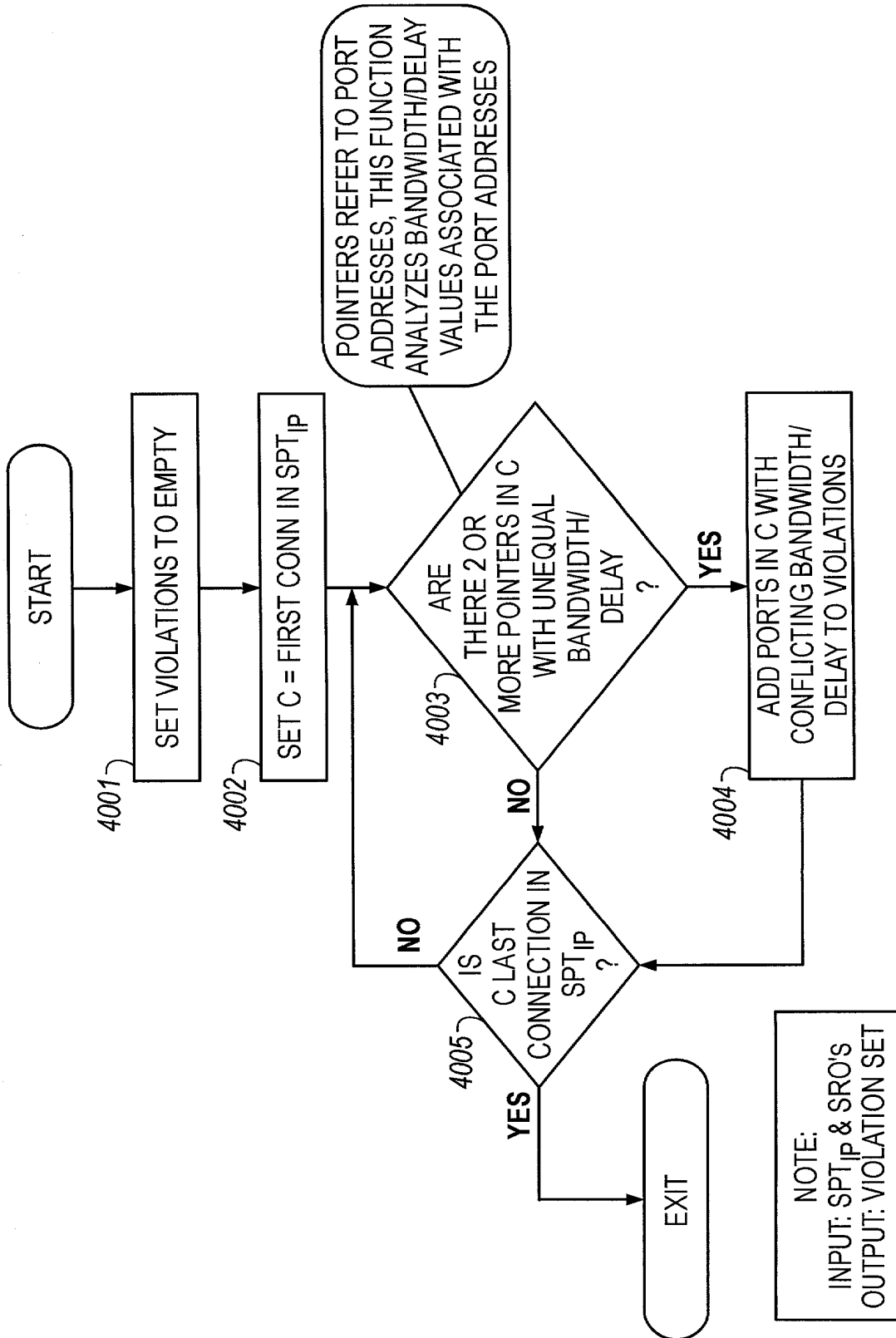


FIG. 40

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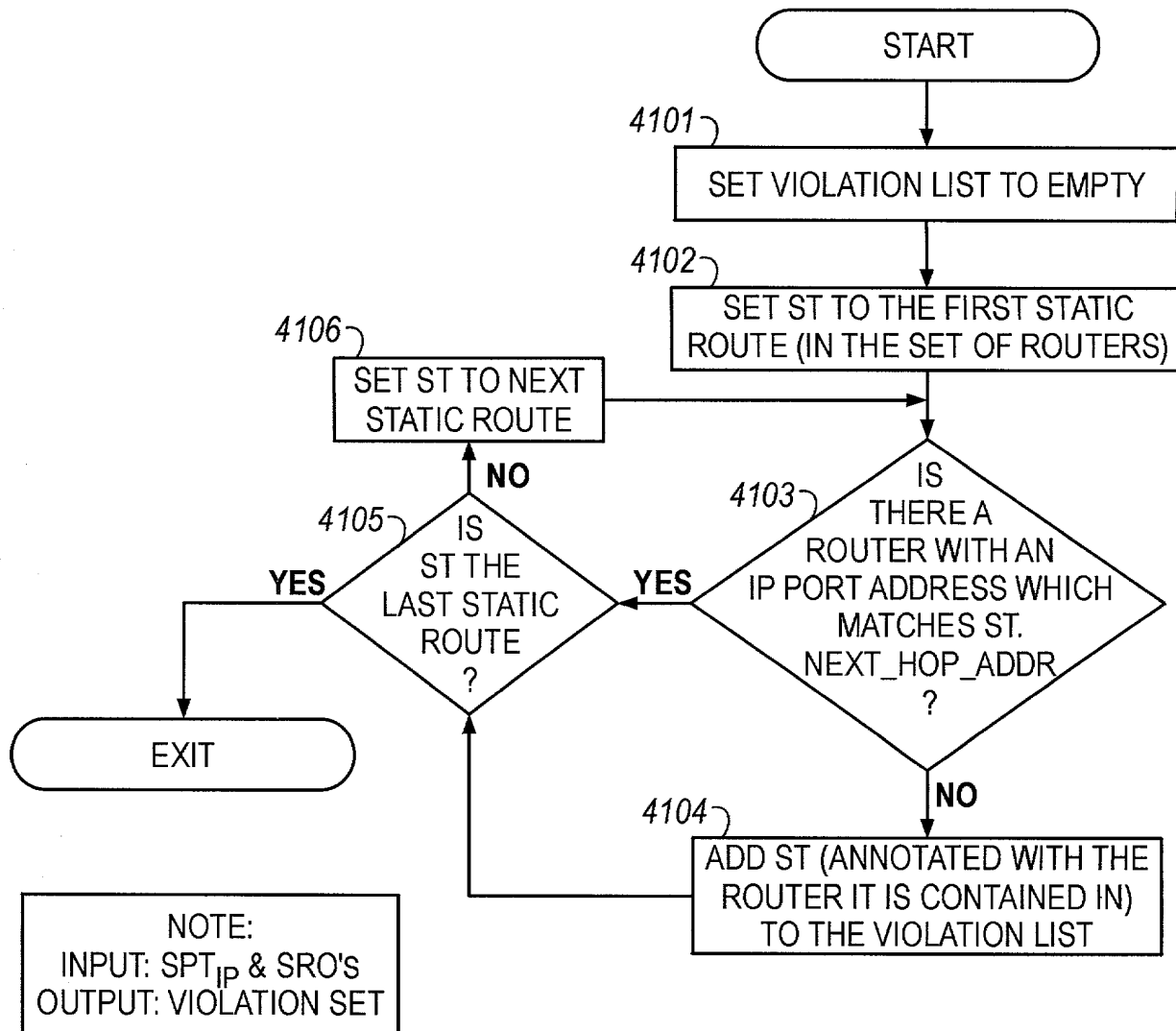


FIG. 41

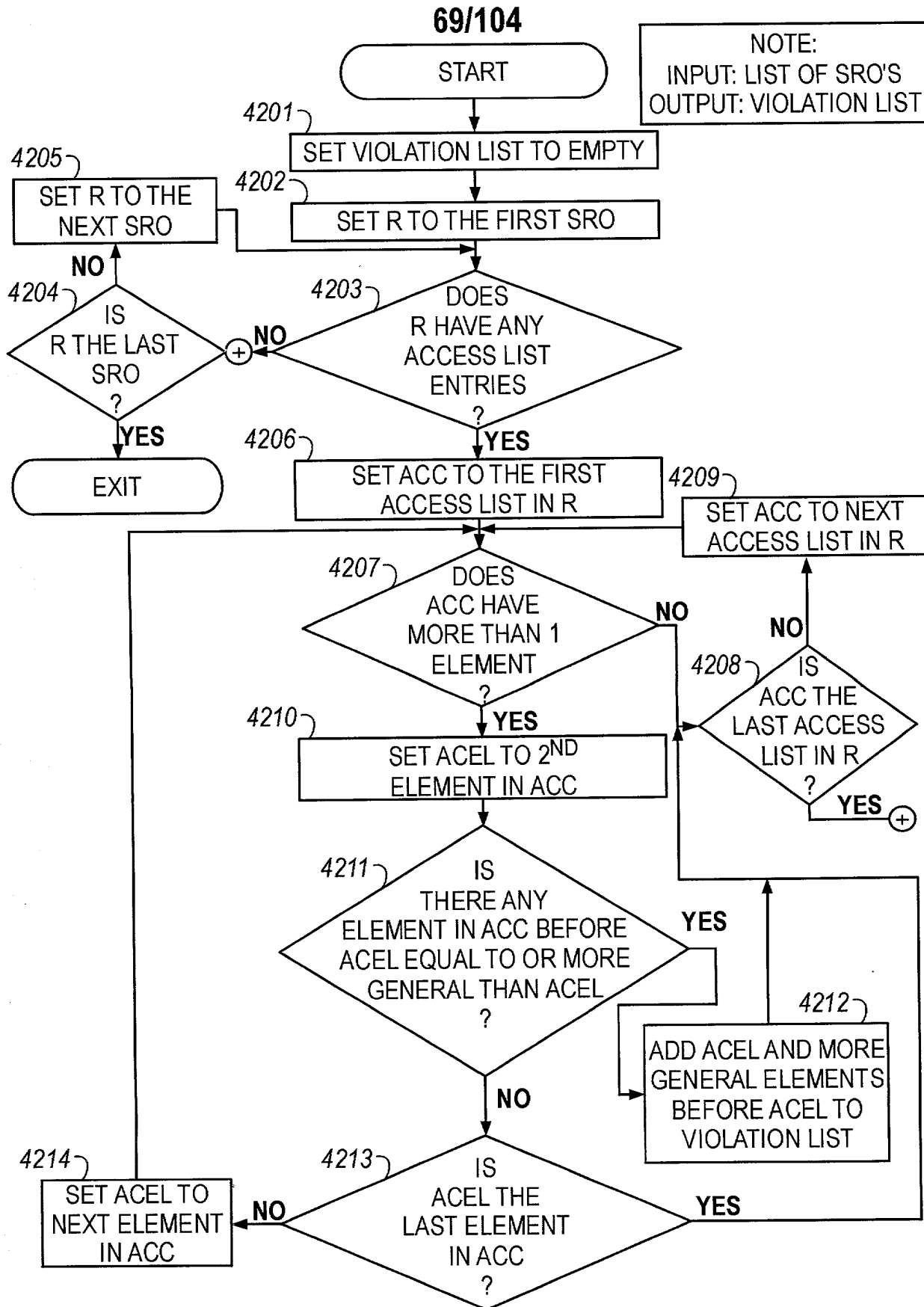


FIG. 42

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INPUTS: SPT_p AND THE SRO'S IT
 POINTS TO, AND THE OPERATIONAL
 STATUS FOR EACH ROUTER, ROUTER
 PORT AND CONNECTION
 OUTPUTS: ROUTING TABLES FOR
 $PROTOCOL_p$ FOR EACH ROUTER

START

4301

FOR EACH ROUTER (IN THE SET OF SRO'S) INITIALIZE ITS
 ROUTING TABLE (FOR $PROTOCOL_p$) TO EMPTY

4302

FOR EACH ROUTER THAT HAS OPERATIONAL STATUS,
 PUT IN A ROUTING TABLE ELEMENT FOR EACH OF ITS
 PORT ADDRESSES (FOR $PROTOCOL_p$) AND STATIC
 ROUTES ASSOCIATED WITH PORTS IN OPERATIONAL STATUS

4303

FOR EACH OPERATIONAL ROUTER, RO , FOR EACH OF RO 'S PORTS PO , THAT
 IS OPERATIONAL AND FOR EACH OF RO 'S ROUTING PROTOCOLS (FOR P) AN
 UPDATE MESSAGE WILL BE DELIVERED TO THE CONNECTION ASSOCIATED
 WITH PO IF IT IS NOT EMPTY; THE UPDATE MESSAGE WILL CONSIST OF
 $\{RT_EL \mid RT_EL = SEND(RT_EL_IN_TABLE, RP, \langle RO, PO \rangle \text{ WHERE } RT_EL_IN_TABLE$
 IS A ROUTING TABLE ELEMENT IN RO 'S ROUTING TABLE}

4304

FOR EACH CONNECTION (IN SPT_p) THAT RECEIVES AN UPDATE MESSAGE
 FROM ROUTER RO , PORT PO , IF IT IS OPERATIONAL, THEN THE UPDATE
 WILL BE PASSED TO ALL THE ROUTER PORTS IT IS POINTING TO EXCEPT
 FOR RO, PO : IF THE CONNECTION IS NOT OPERATIONAL ALL UPDATE
 MESSAGES ARE DROPPED

4305

FOR EACH OPERATIONAL ROUTER RO AND EACH UPDATE UPD THAT IT
 RECEIVES THROUGH PORT PO , IF PO IS OPERATIONAL, THE SET UPD_TO_PROC
 WILL BE FORMED; IF PO IS NOT OPERATIONAL, UPD IS DROPPED; UPD_TO_PROC
 IS DEFINED AS THE SET: $\{RT_EL \mid RT_EL = RECEIVE(RT_EL_UPD, RP, \langle RO, PO \rangle$
 WHERE RT_EL_UPD IS A MEMBER OF UPD , AND RT_EL 'S DESTINATION IS NOT
 IN RO 'S ROUTING TABLE, OR IF IT IS THEN IT EITHER HAS A BETTER COST/ADMIN
 DISTANCE OR AN EQUAL COST/ADMIN DISTANCE, BUT NOT AN EXACT MATCH}

A

B

FIG. 43A

2021-05-05 10:07:43

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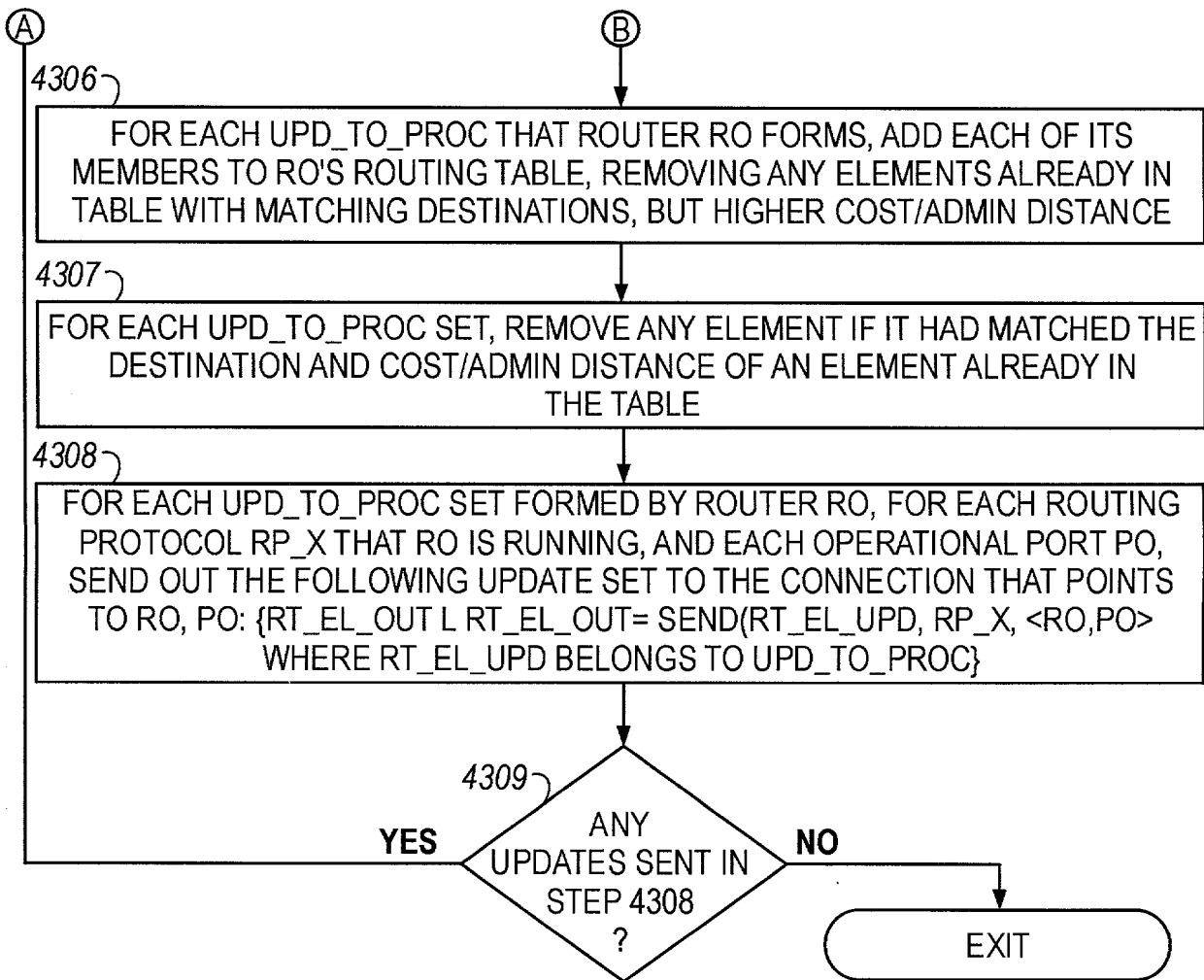


FIG. 43B

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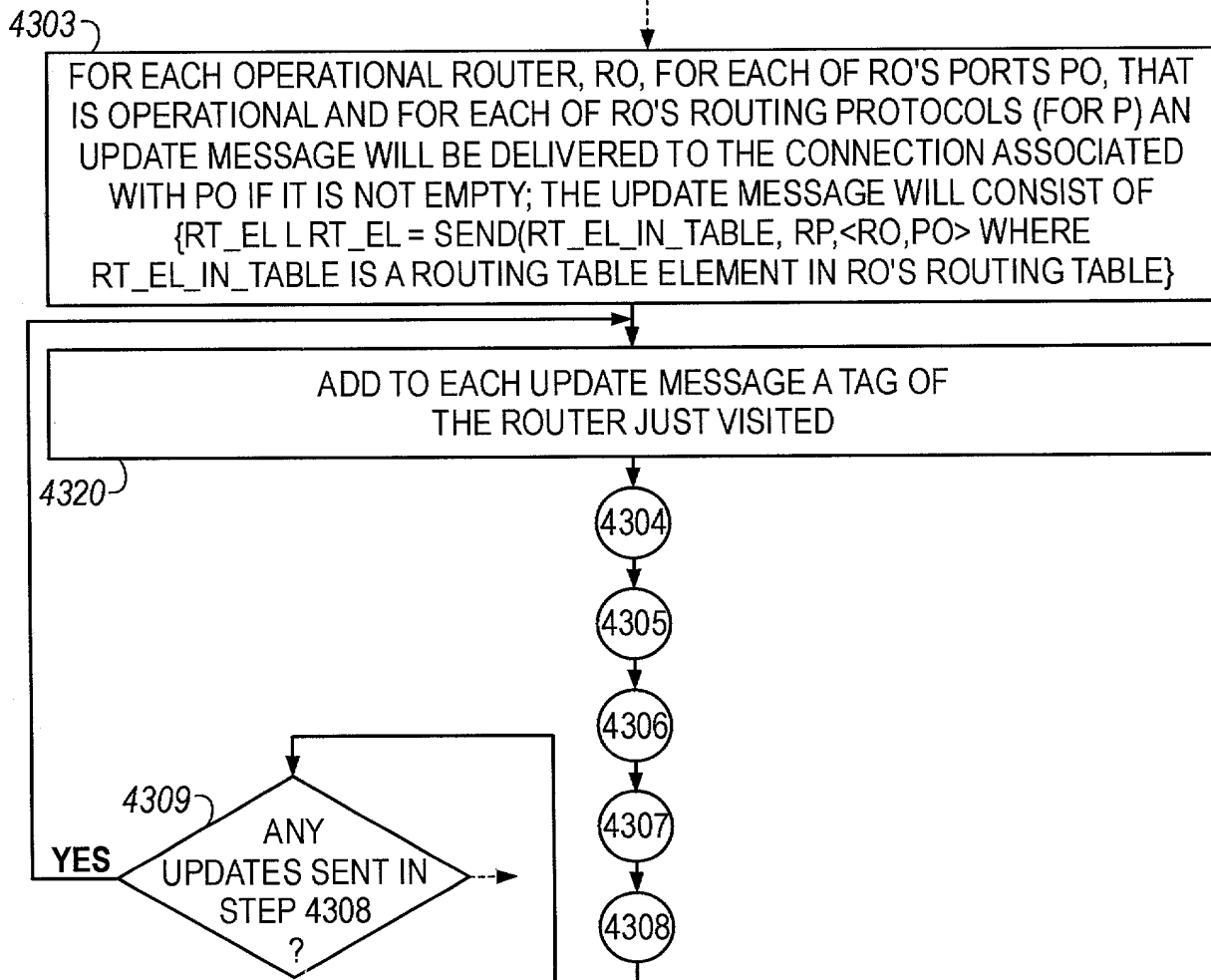


FIG. 43C

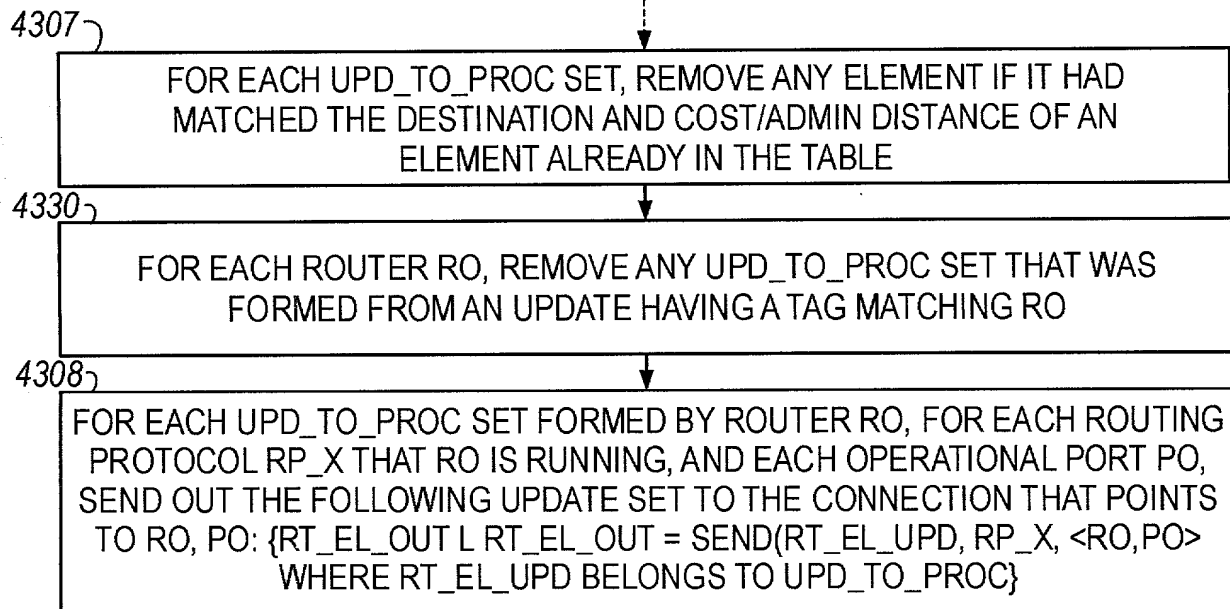


FIG. 43D

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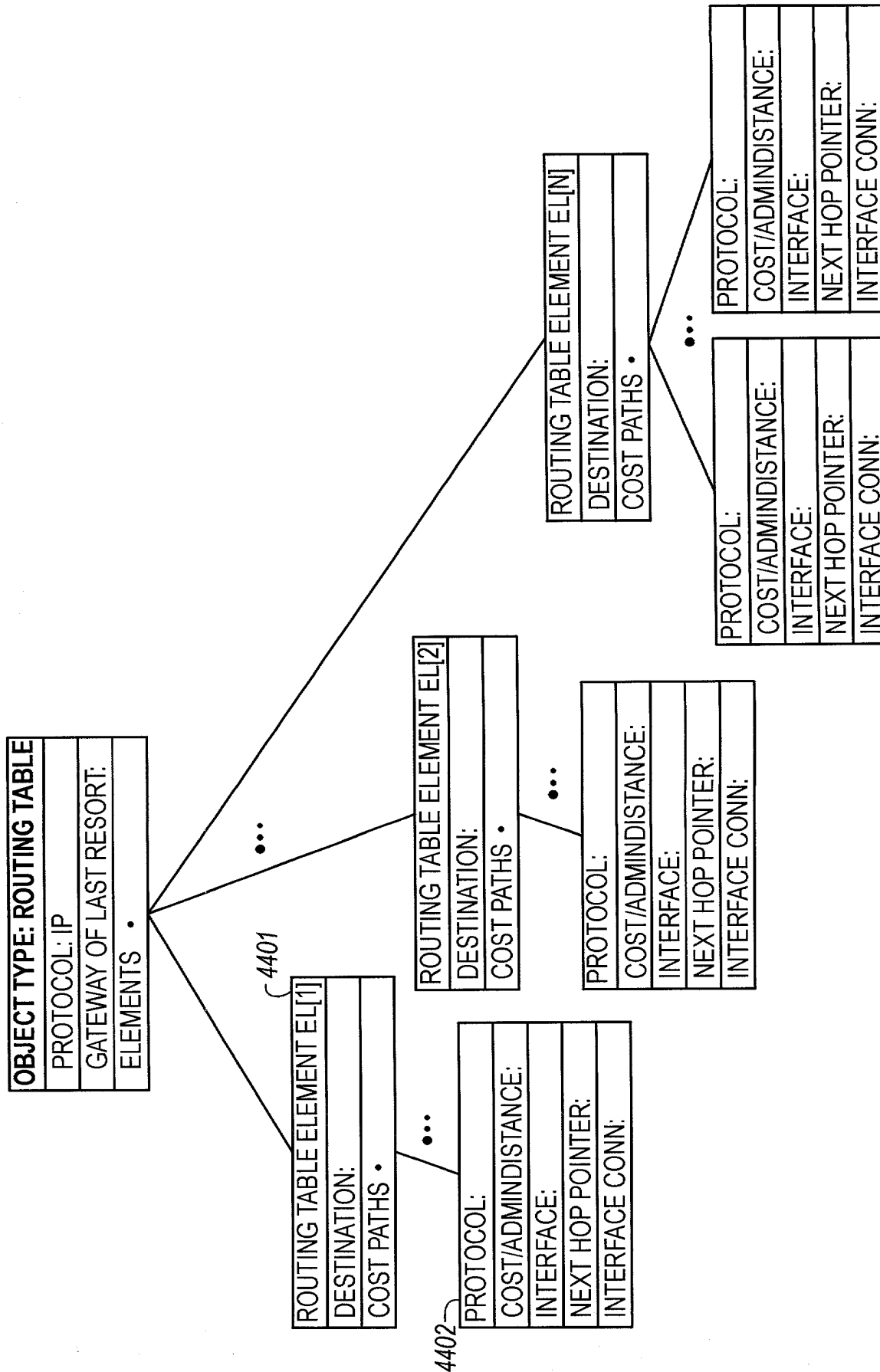
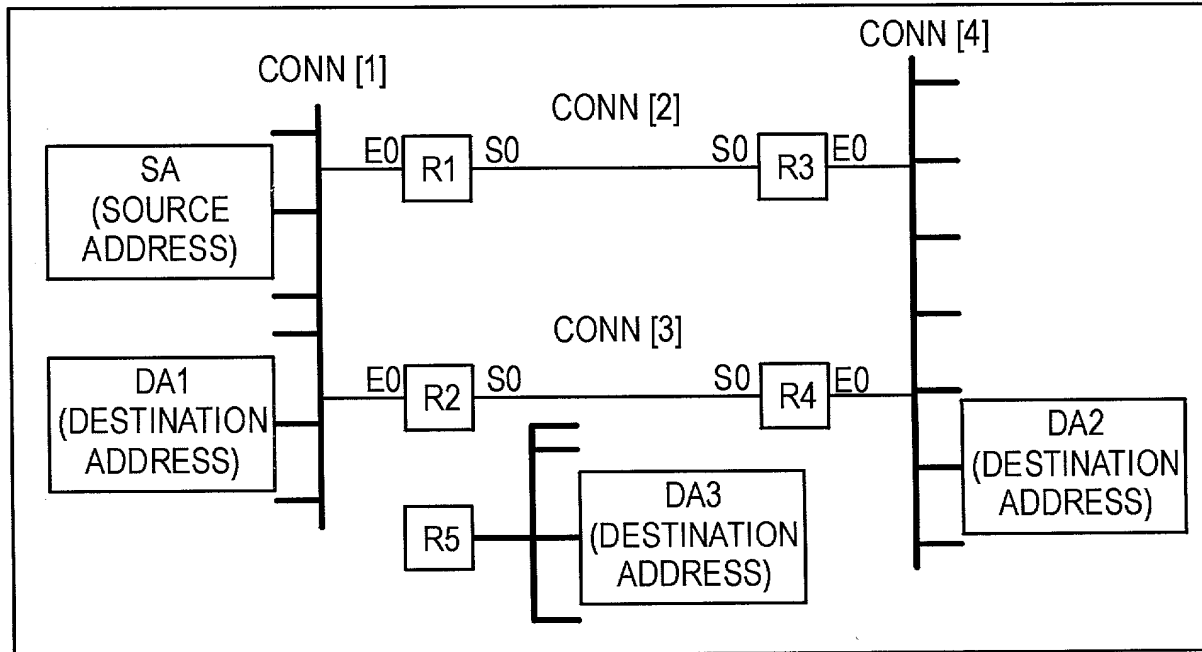


FIG. 44

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DATA LABELS USED IN
CPS DISCUSSION

SC SOURCE CONNECTION
 DC DESTINATION CONNECTION
 SA SOURCE ADDRESS
 DA DESTINATION ADDRESS
 CPS COMPLETED PATH SET
 APS ACTIVE PATH SET
 SPT SINGLE PROTOCOL TOPOLOGY
 CR CURRENT ROUTER
 NC NEW CONNECTION
 EL ROUTING TABLE ELEMENT
 P PROTOCOL
 CPO COST PATH OBJECT

DEFINITION: COMPLETED PATH SET - CPS

THE SET HAVING: NO ELEMENTS; 1 ELEMENT; OR, MORE THAN 1 ELEMENT

NO ELEMENTS MEANS: NO PATH FROM SA TO DA
 ONE (1) ELEMENT MEANS: ONE PATH FROM SA TO DA
 MORE THAN ONE ELEMENT: MULTIPLE PATHS FROM SA TO DA

THE CPS FOR SA TO DA2 LOOKS LIKE:
 {[SA;CONN[1];R1;CONN[2];R3;CONN[4];DA2]
 [SA;CONN[1];R2;CONN[3];R4;CONN[4]DA2]}

THE CPS FOR SA TO DA1 LOOKS LIKE:
 {[SA;CONN[1];DA1]}

THE CPS FOR SA TO DA3 LOOKS LIKE:
 {}

FIG. 45

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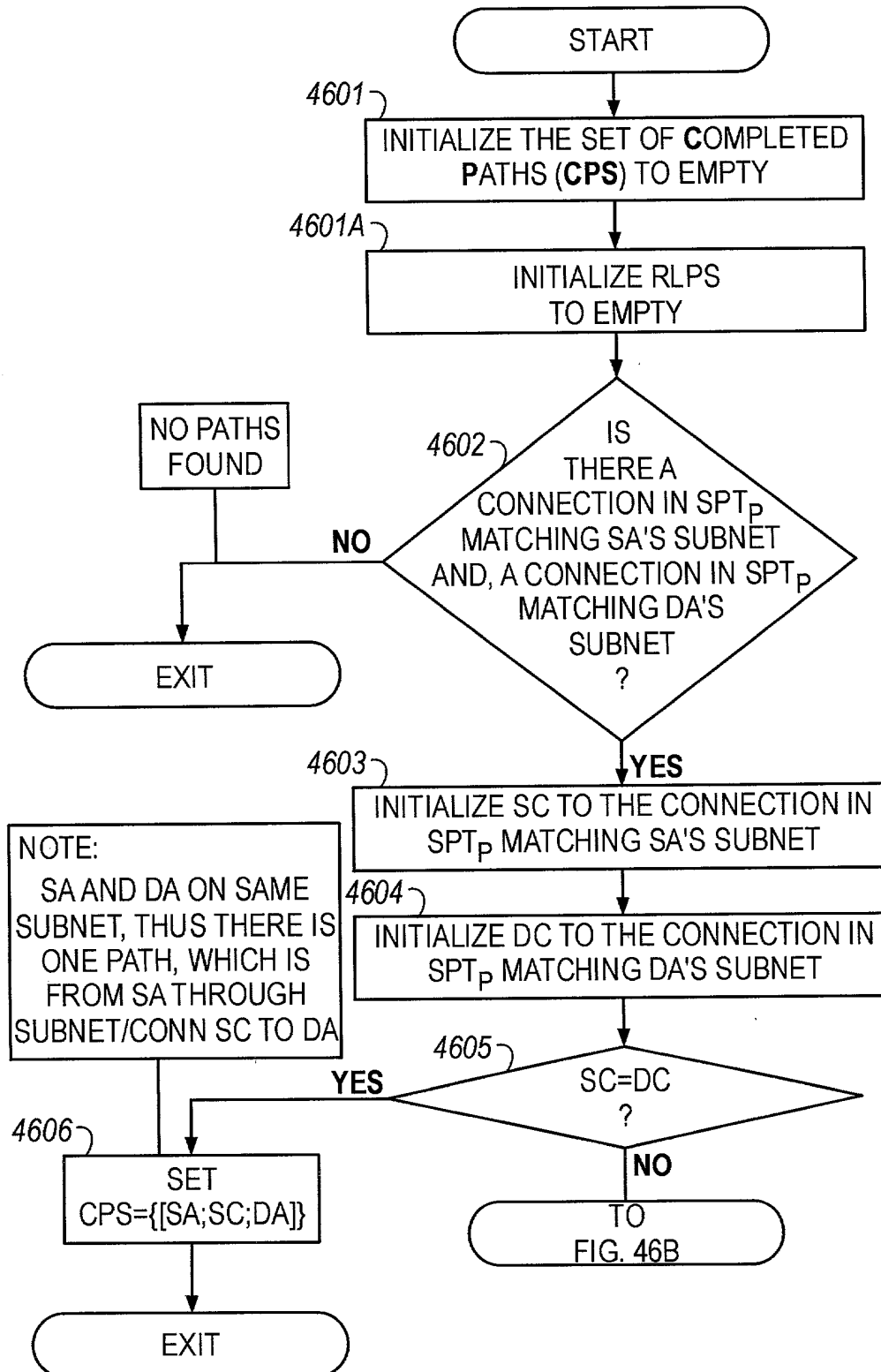


FIG. 46A

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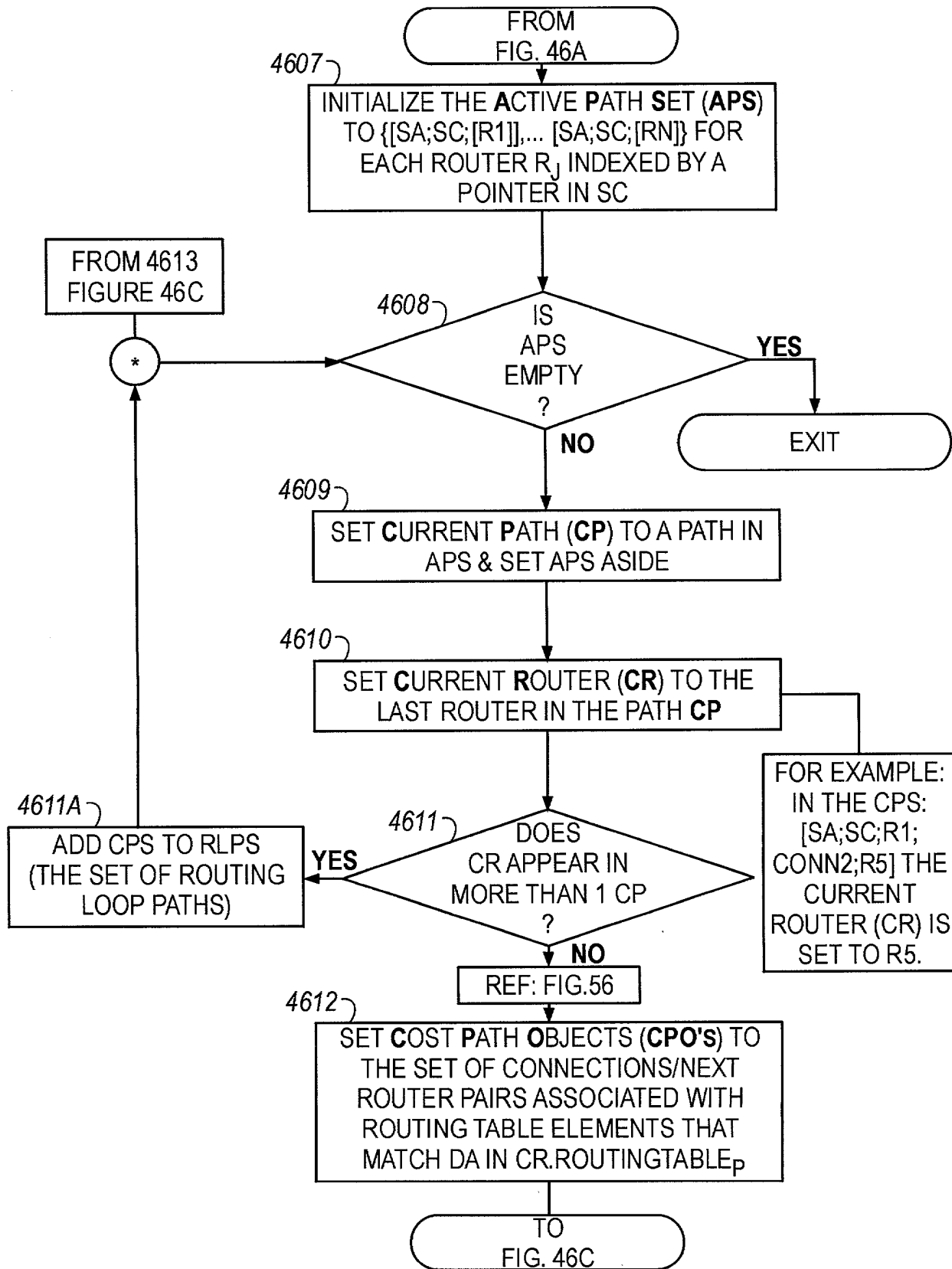
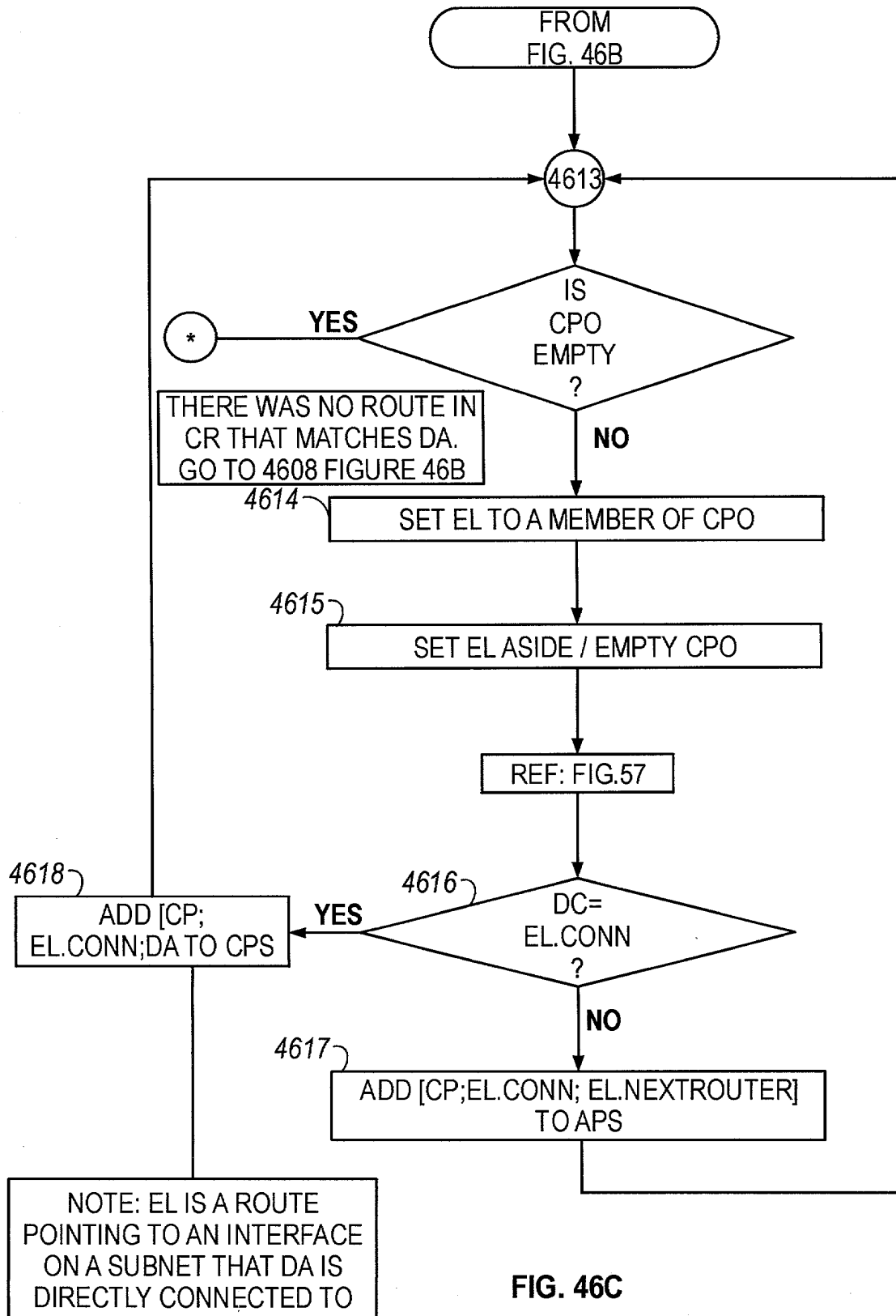


FIG. 46B

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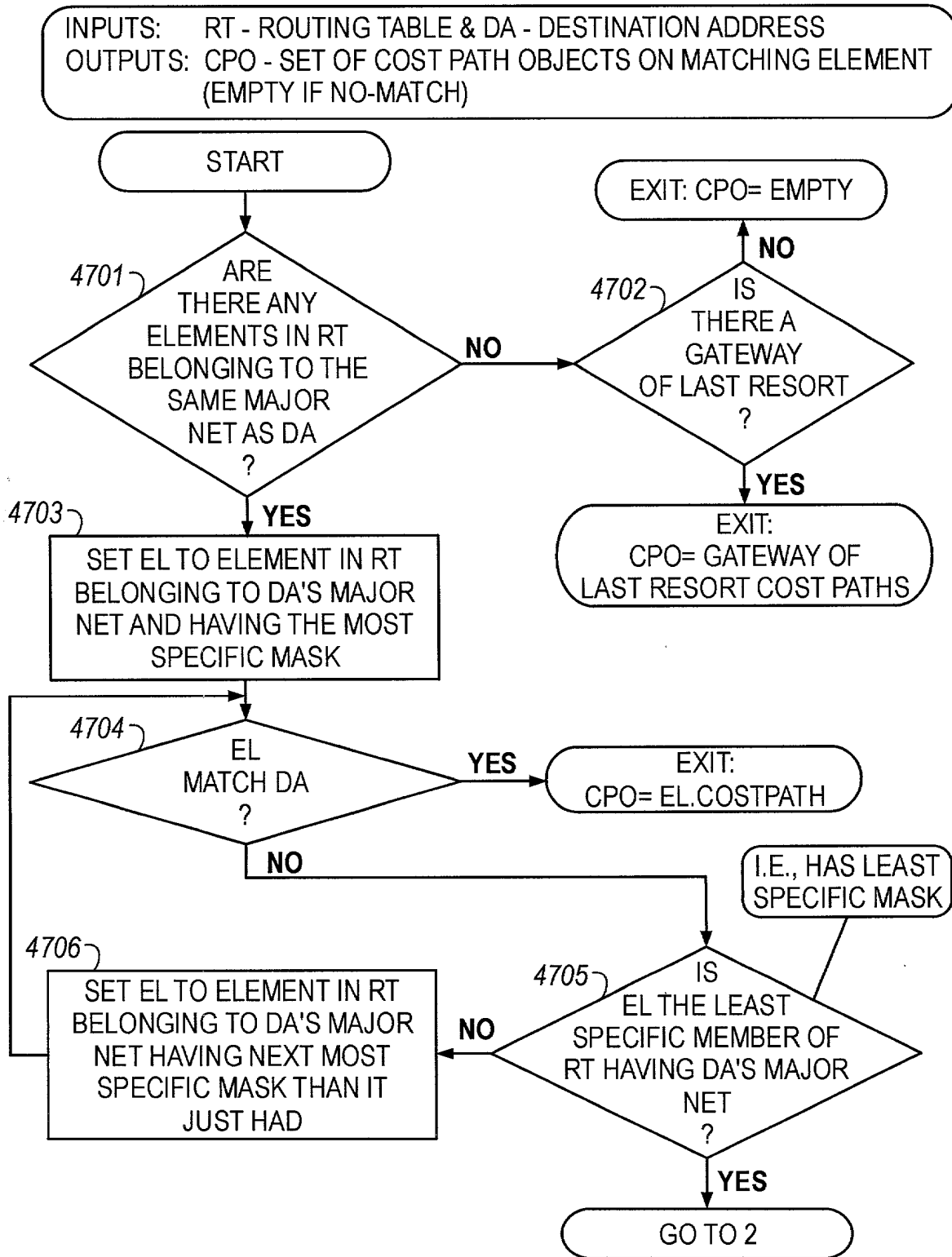


FIG. 47

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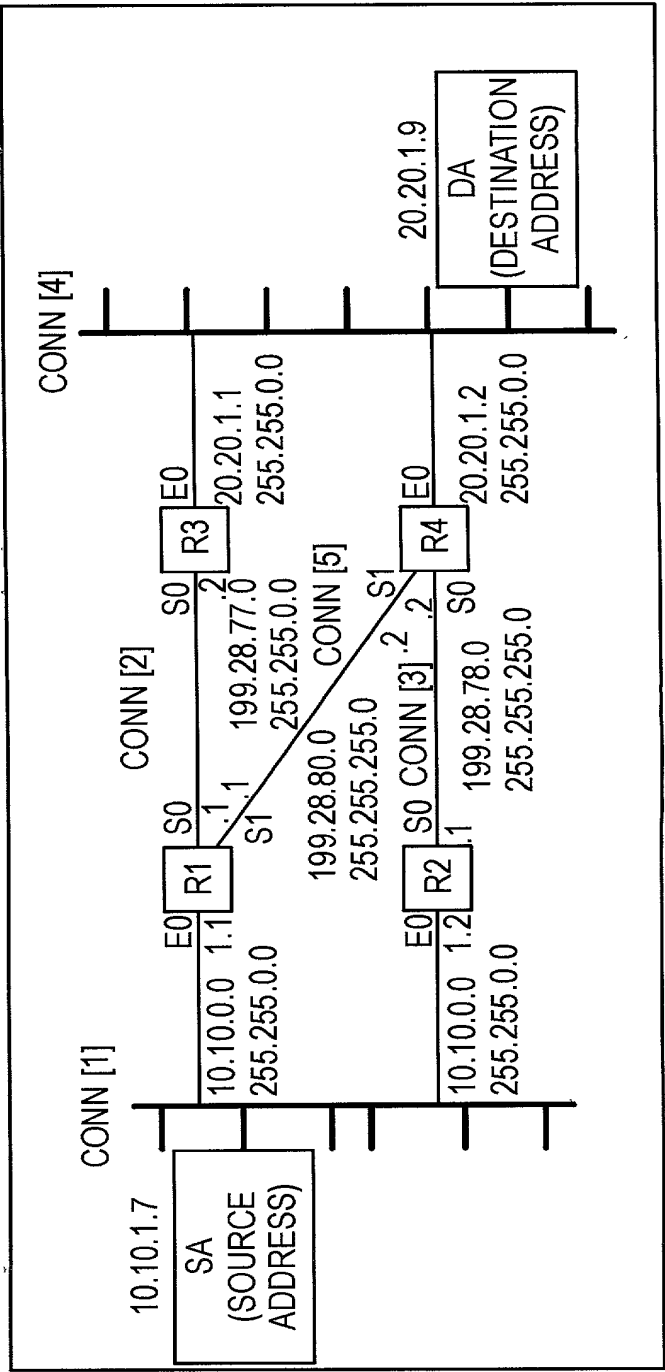


FIG. 48

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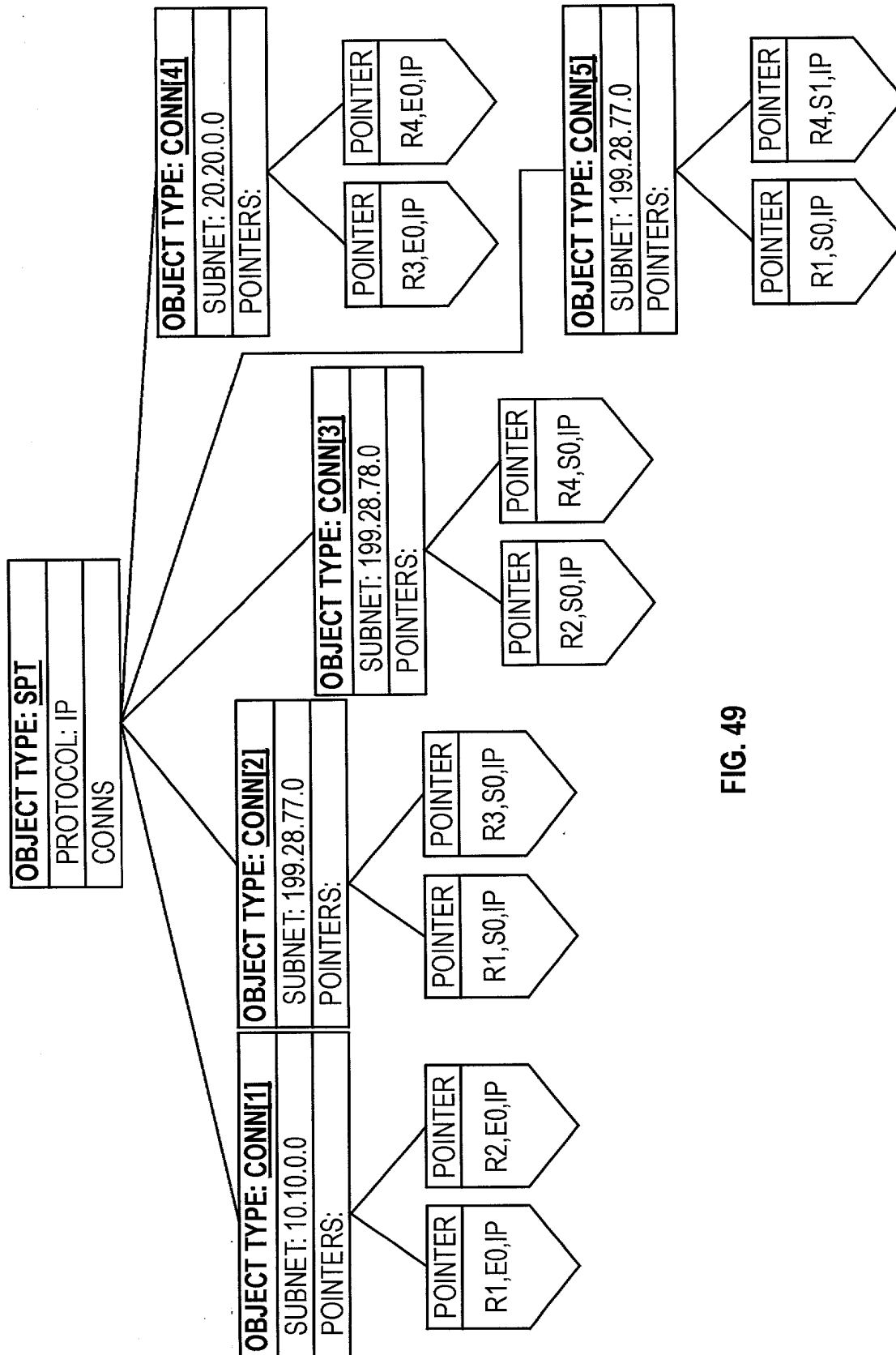


FIG. 49

2021.08.20 5:03:42 PM

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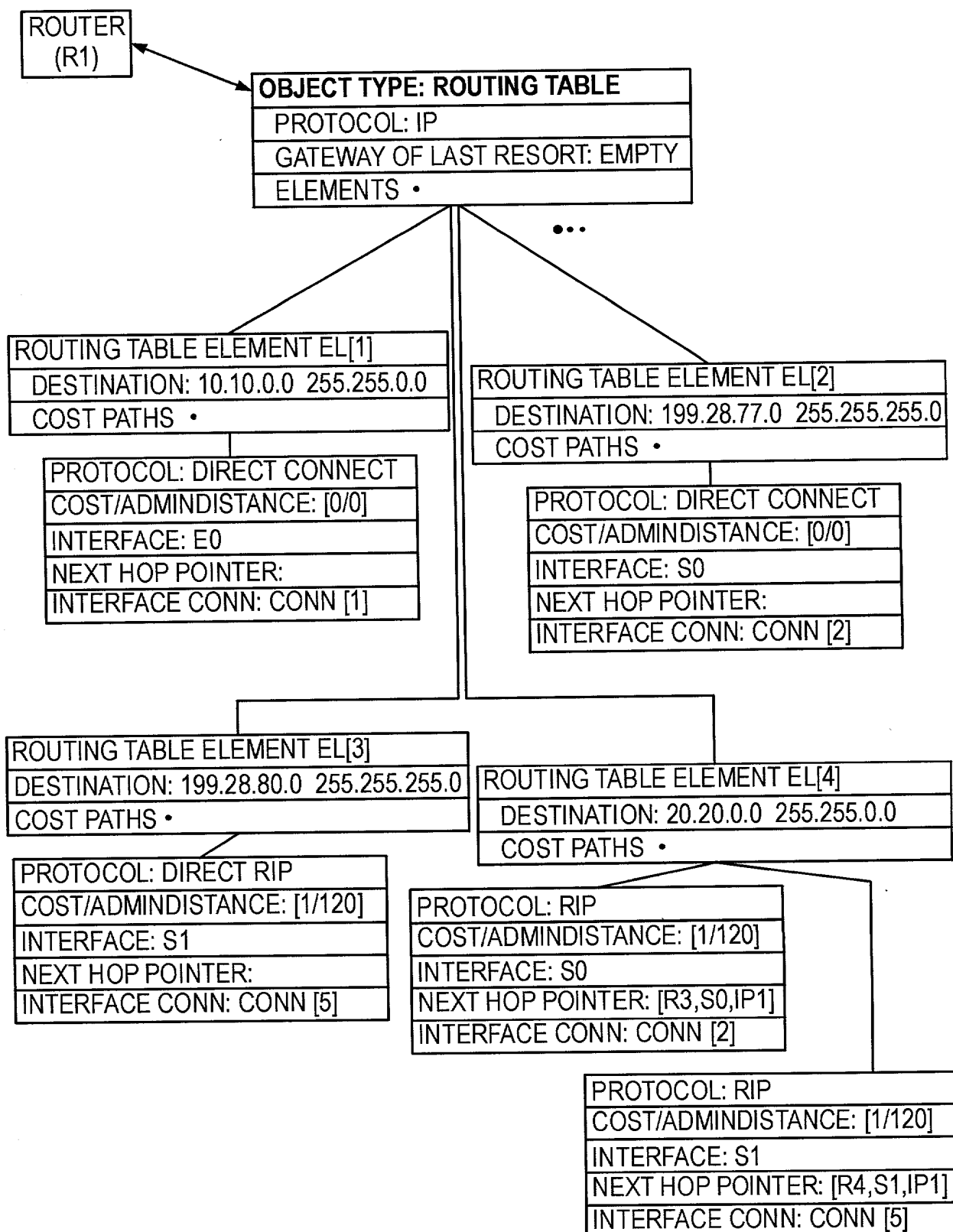


FIG. 50

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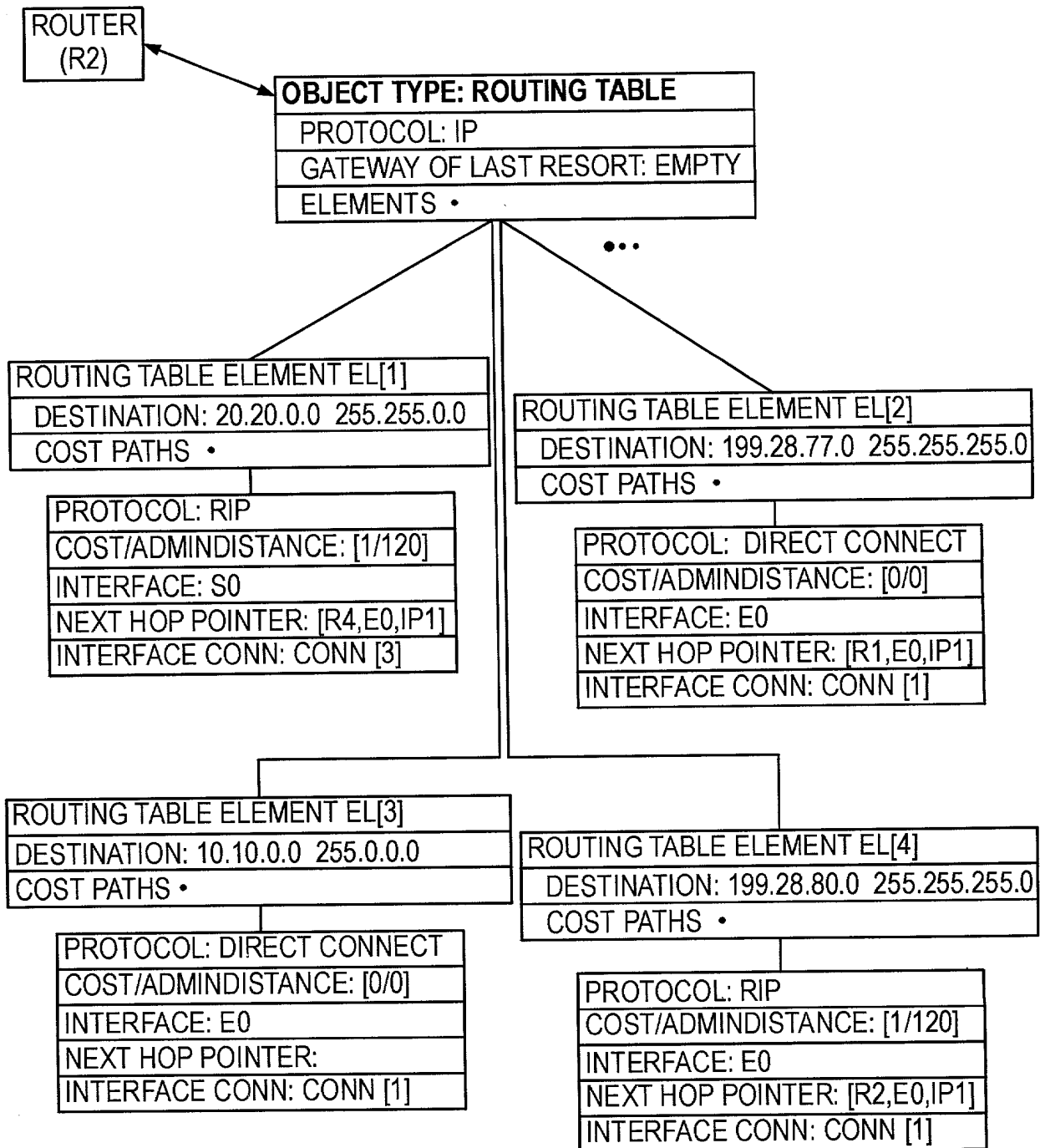


FIG. 51

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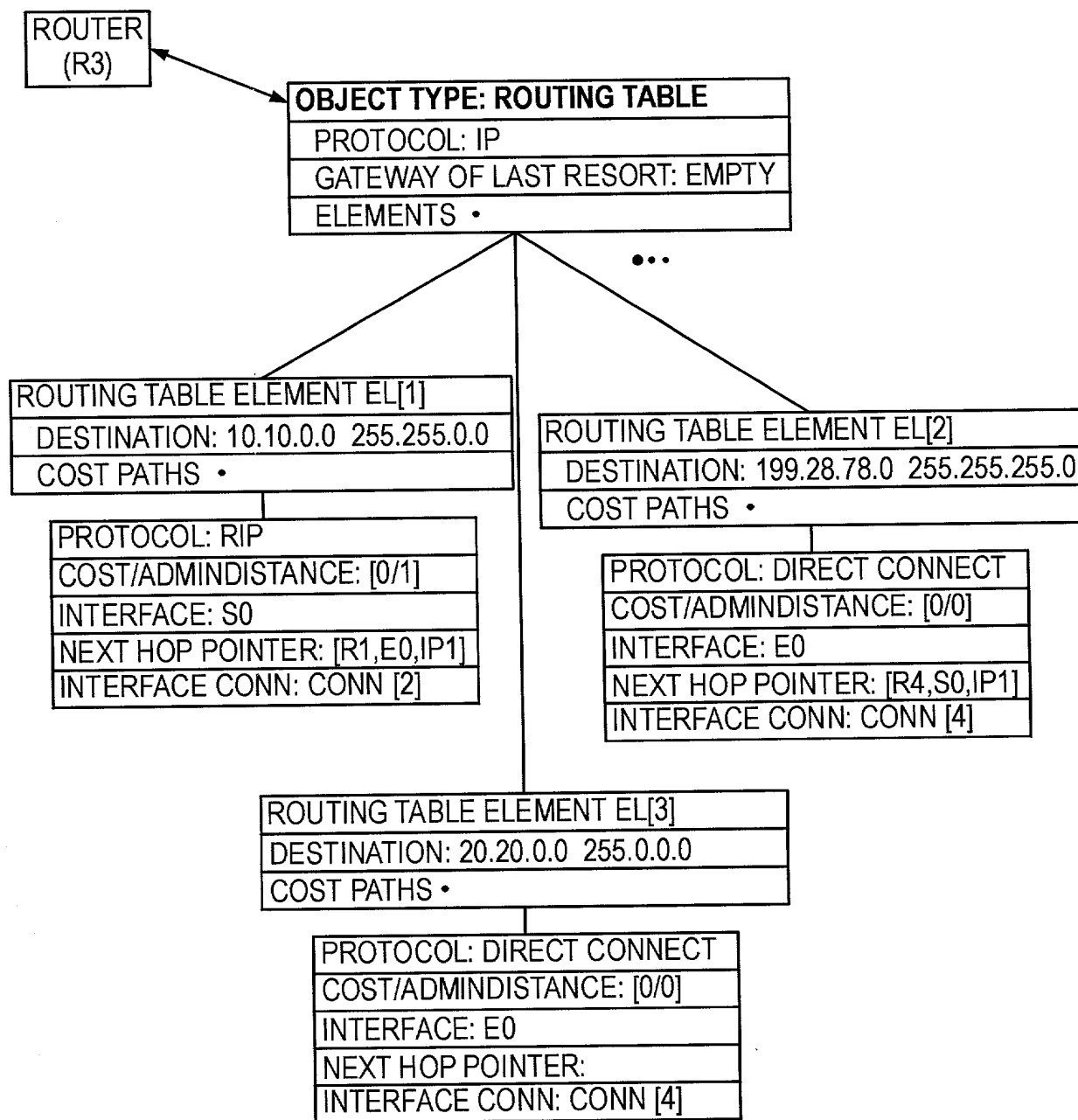


FIG. 52A

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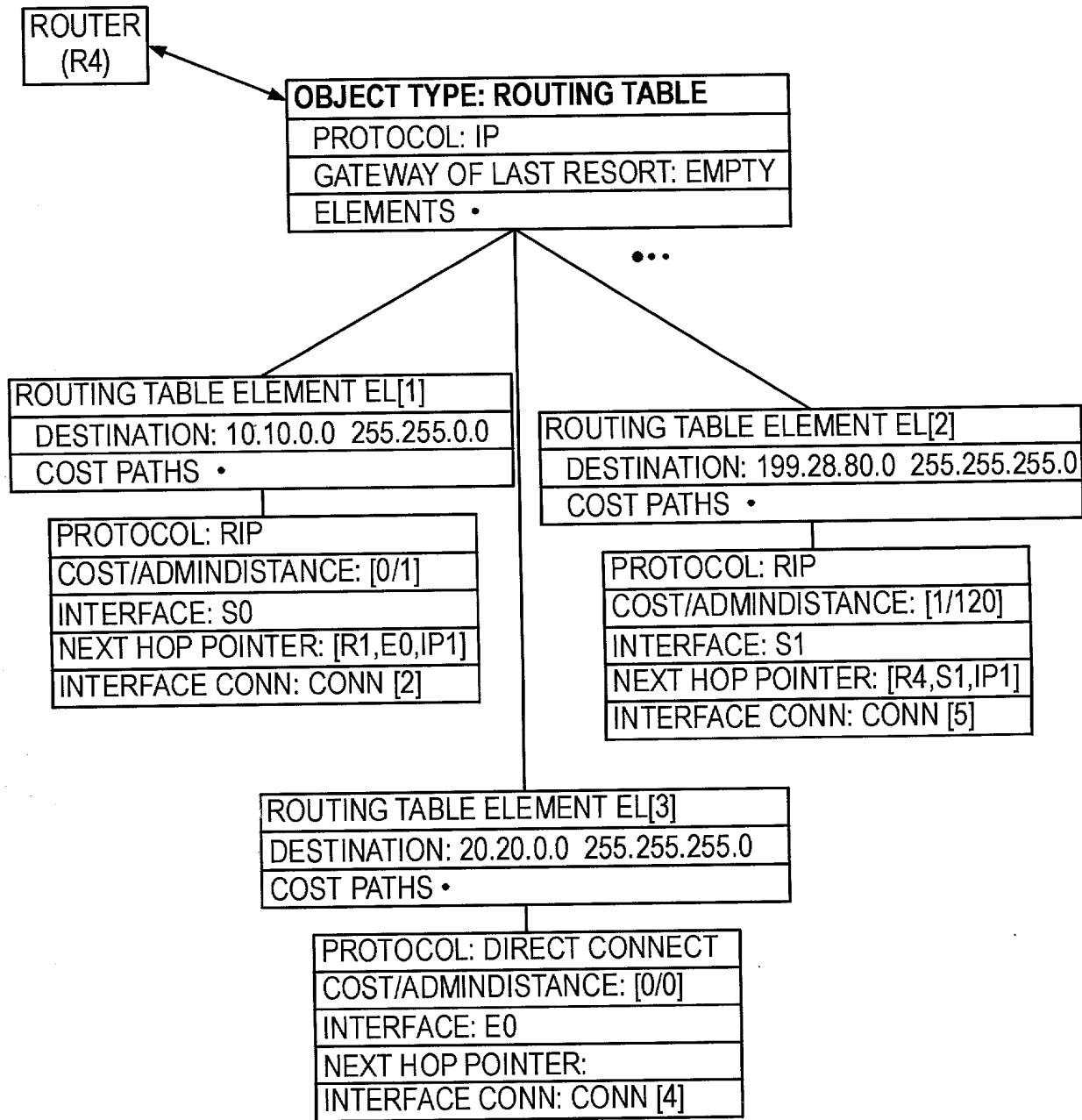


FIG. 52B

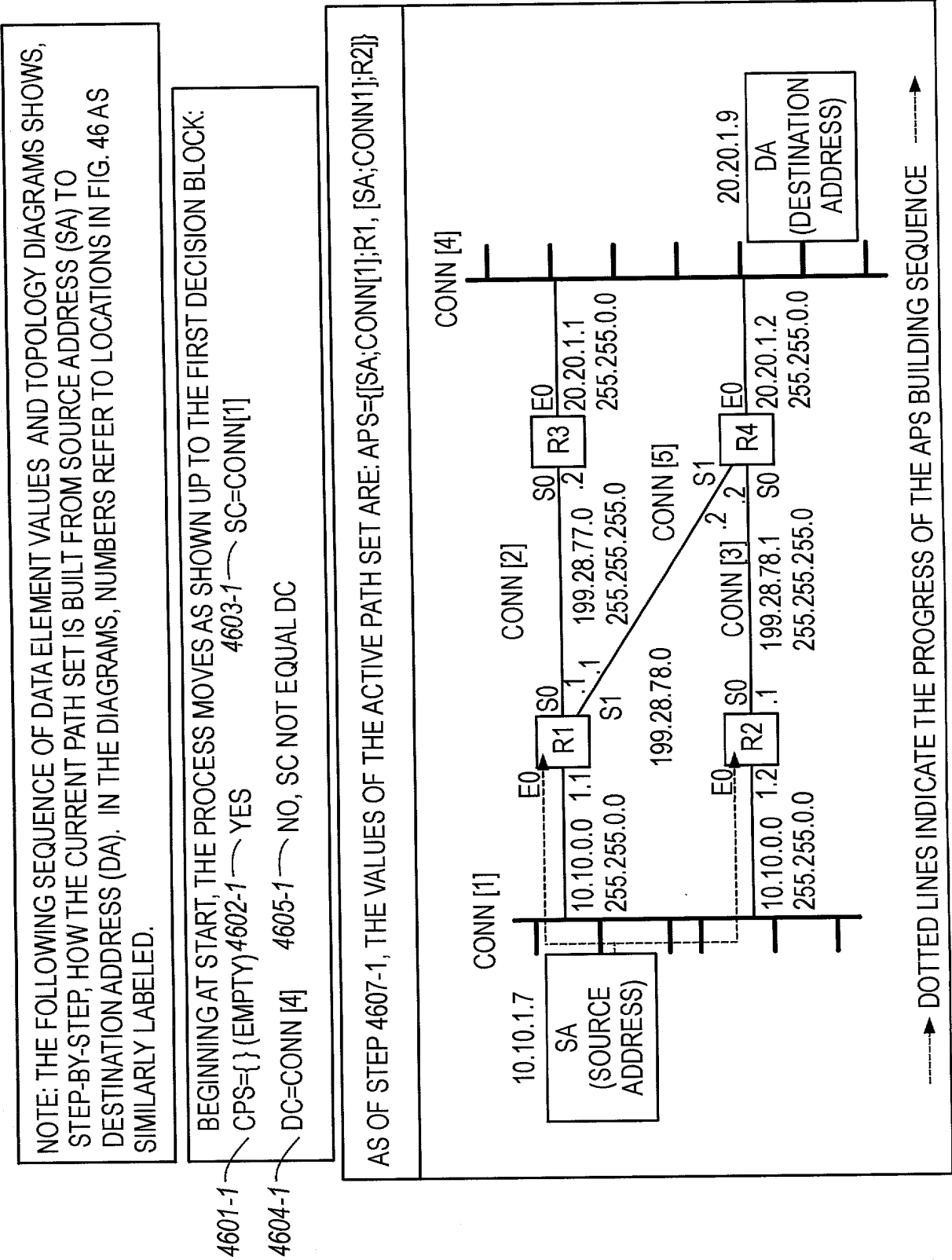


FIG. 53A

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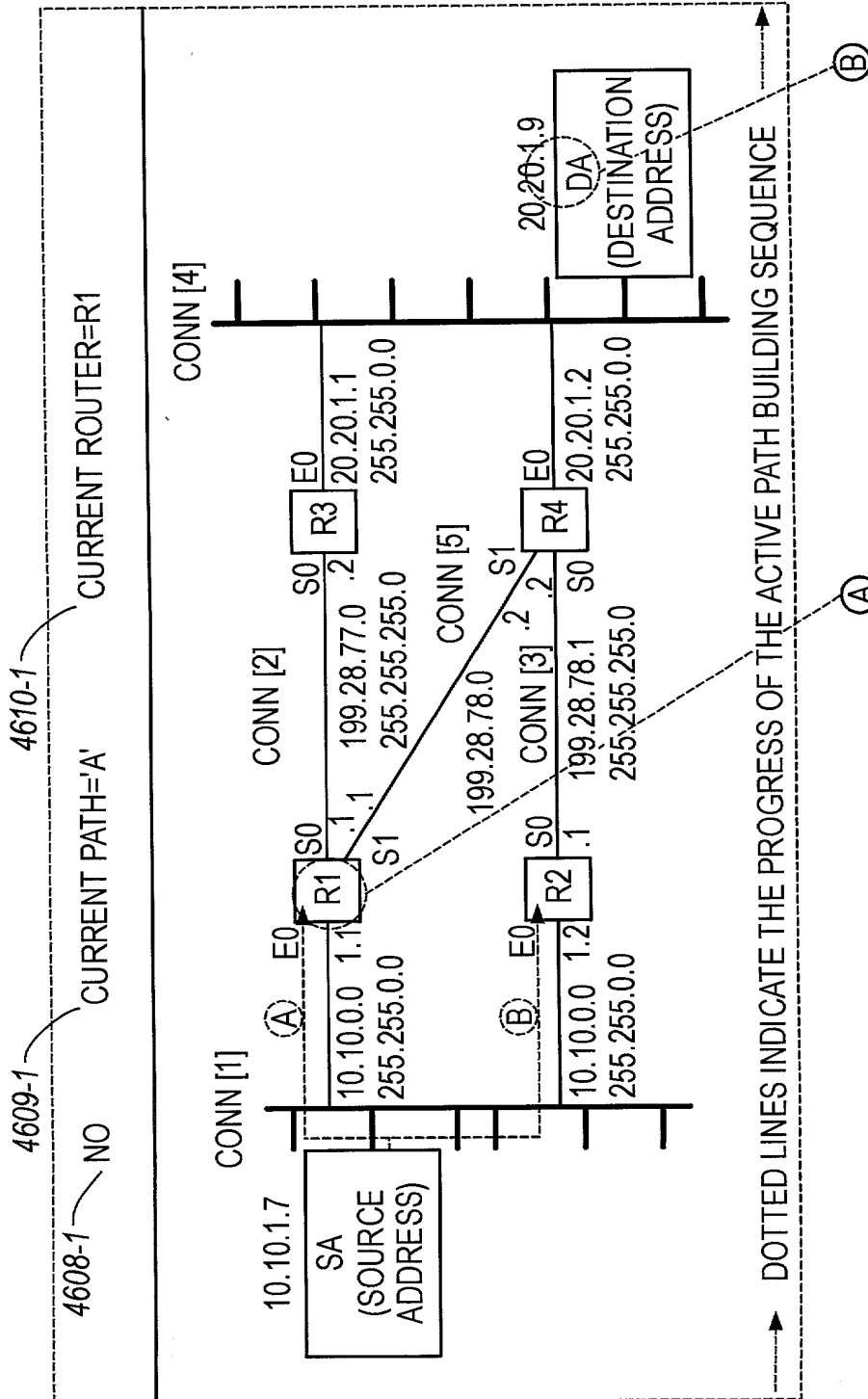


FIG. 53B

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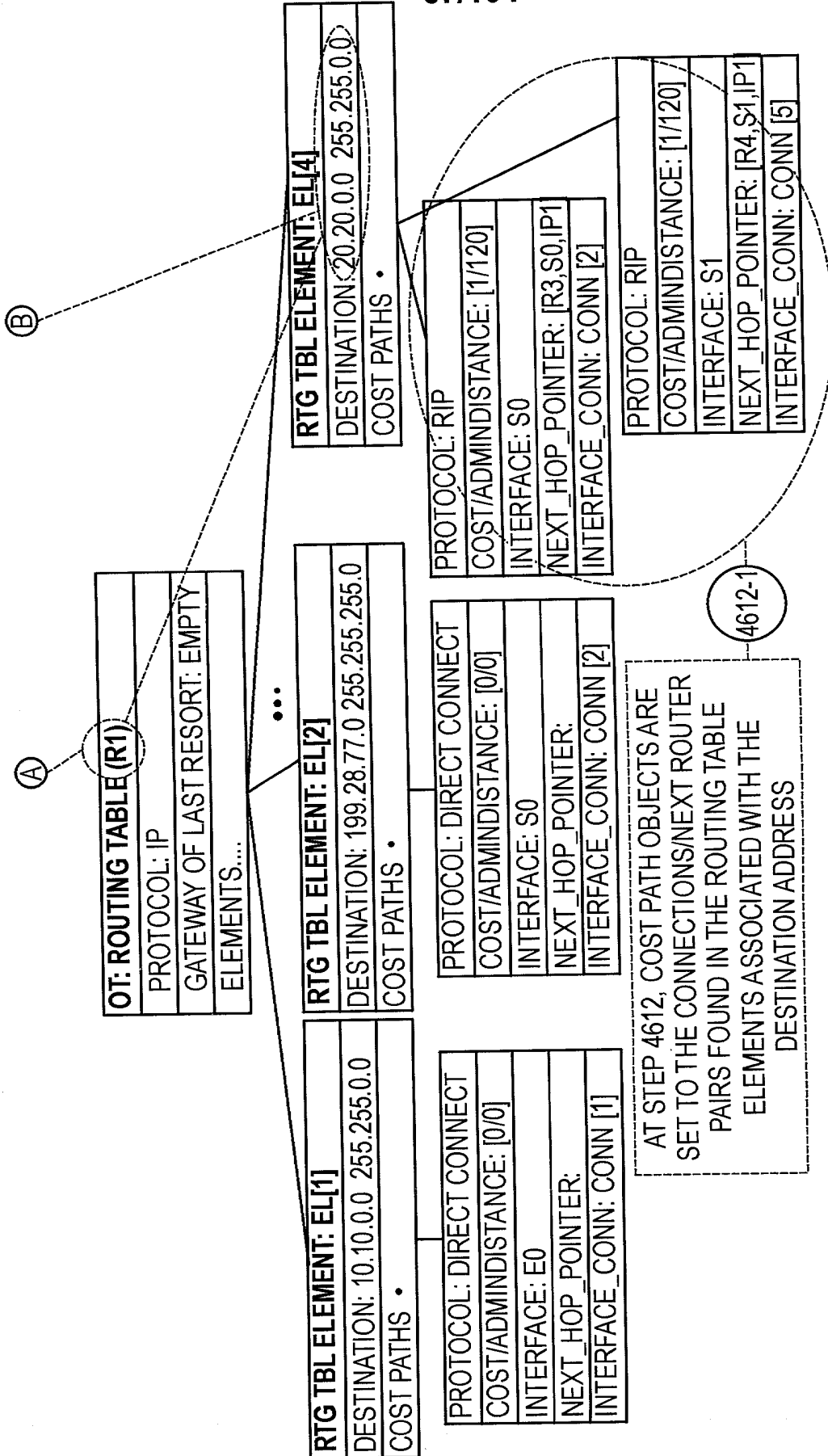


FIG. 53C

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PROTOCOL: RIP
COST/ADMINDISTANCE: [1/120]
INTERFACE: S0
NEXT_HOP_POINTER: [R3,S0,IP1]
INTERFACE_CONN: CONN [2]

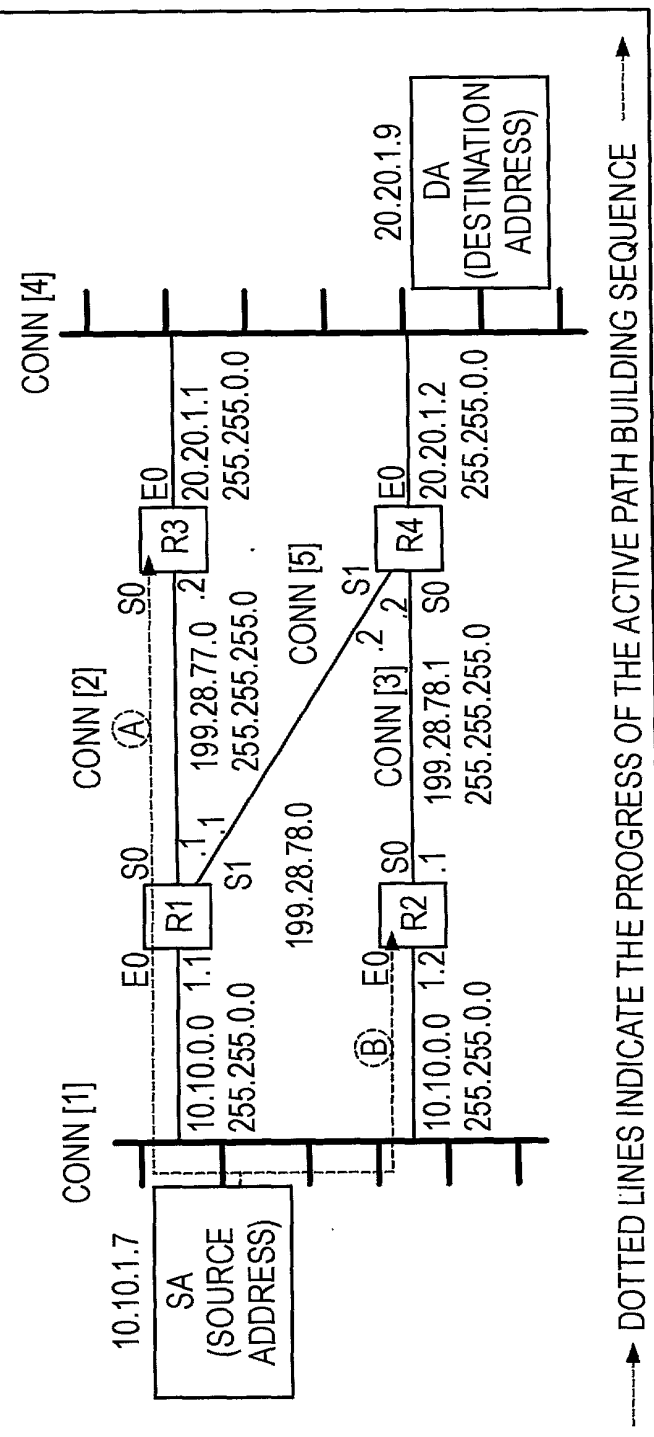
4613-1 FINDING ROUTES TO DA,
TEST 13 IS FAILED

4614-1, 4615-1 EL IS SET TO A MEMBER O THE
COST PATH OBJECTS (CPO'S)

4616-1 DEST. CONN (DC) = CONN[4]
EL.CONN=CONN[2]: FAILS TEST

4617-1

ADD [CP;EL.CONN; EL;NEXTROUTER TOAPS
APS={ [SA;CONN[1];R1;CONN[2];R3], [SA;CONN[1];R2]} (A)



AFTER STEP 4617,
THE FLOW
BRANCHES BACK
UP TO STEP 4613...

→ DOTTED LINES INDICATE THE PROGRESS OF THE ACTIVE PATH BUILDING SEQUENCE →

FIG. 53D

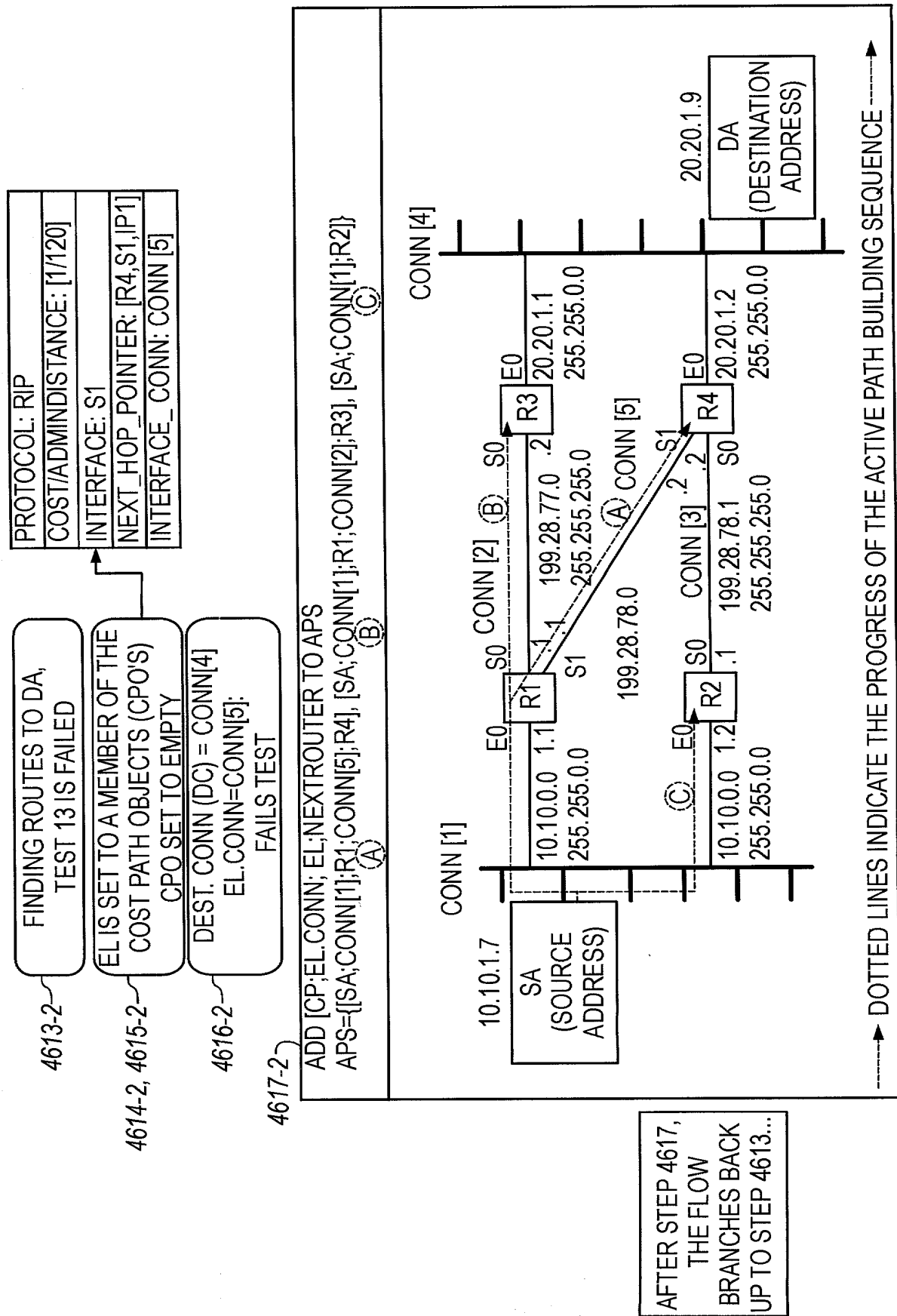


FIG. 53E

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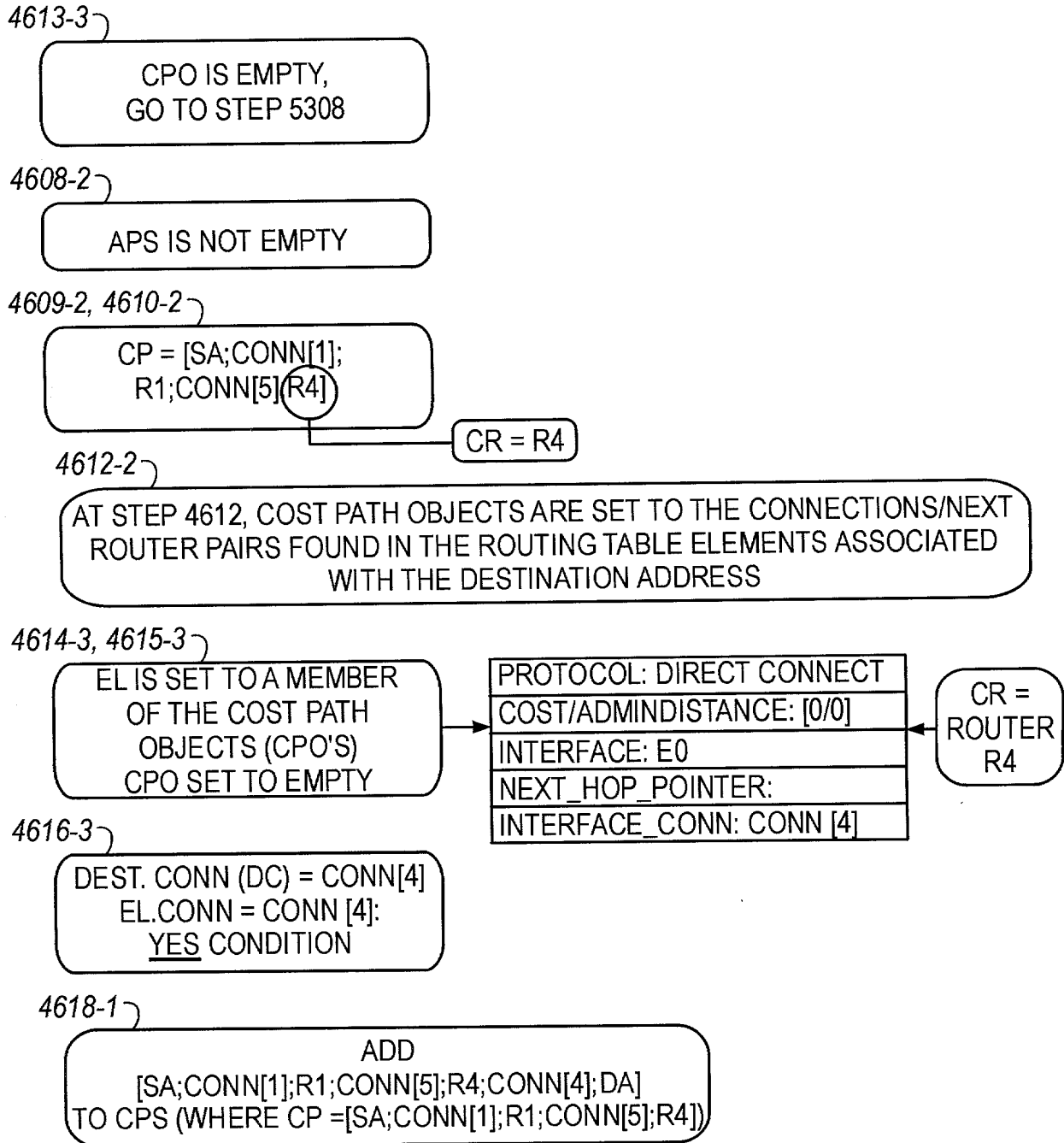
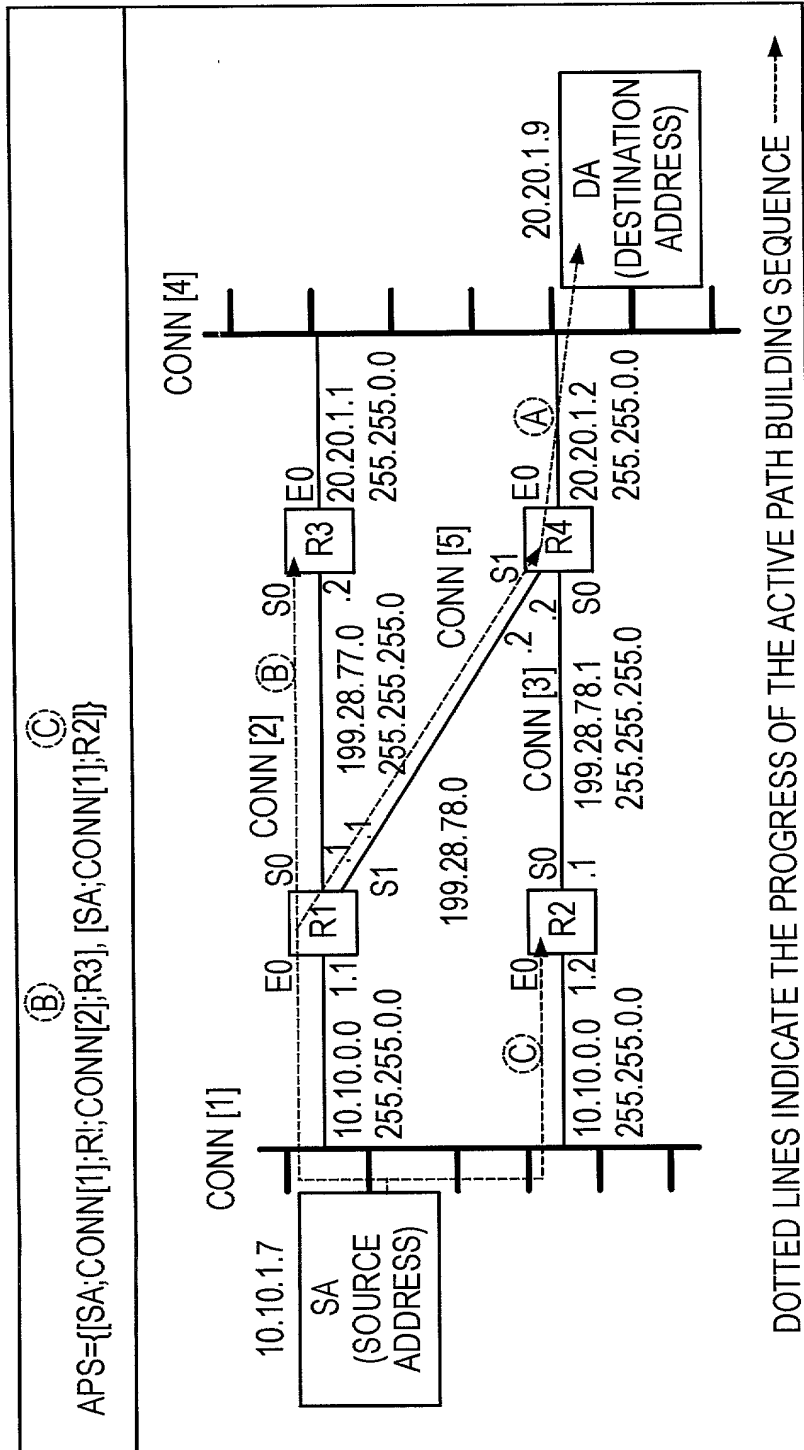


FIG. 53F

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NOTE: AT THIS JUNCTURE, THE FIRST COMPLETED PATH FROM SA TO DA HAS BEEN ESTABLISHED. THE ALGORITHM WILL CONTINUE AS SHOWN ABOVE BETWEEN STEP 4613-3, AND STEP 4608-2 UNTIL ALL PATHS HAVE BEEN ESTABLISHED. THEN THE APS WILL BE EMPTY AND THE ALGORITHM EXITED.

FIG. 53G

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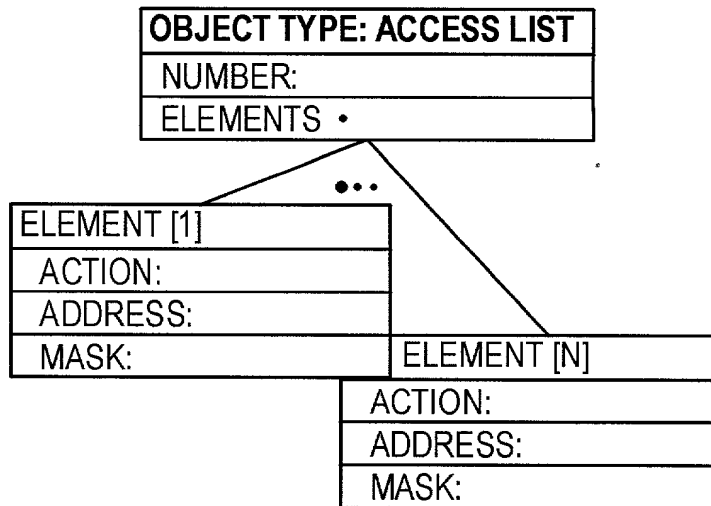


FIG. 54

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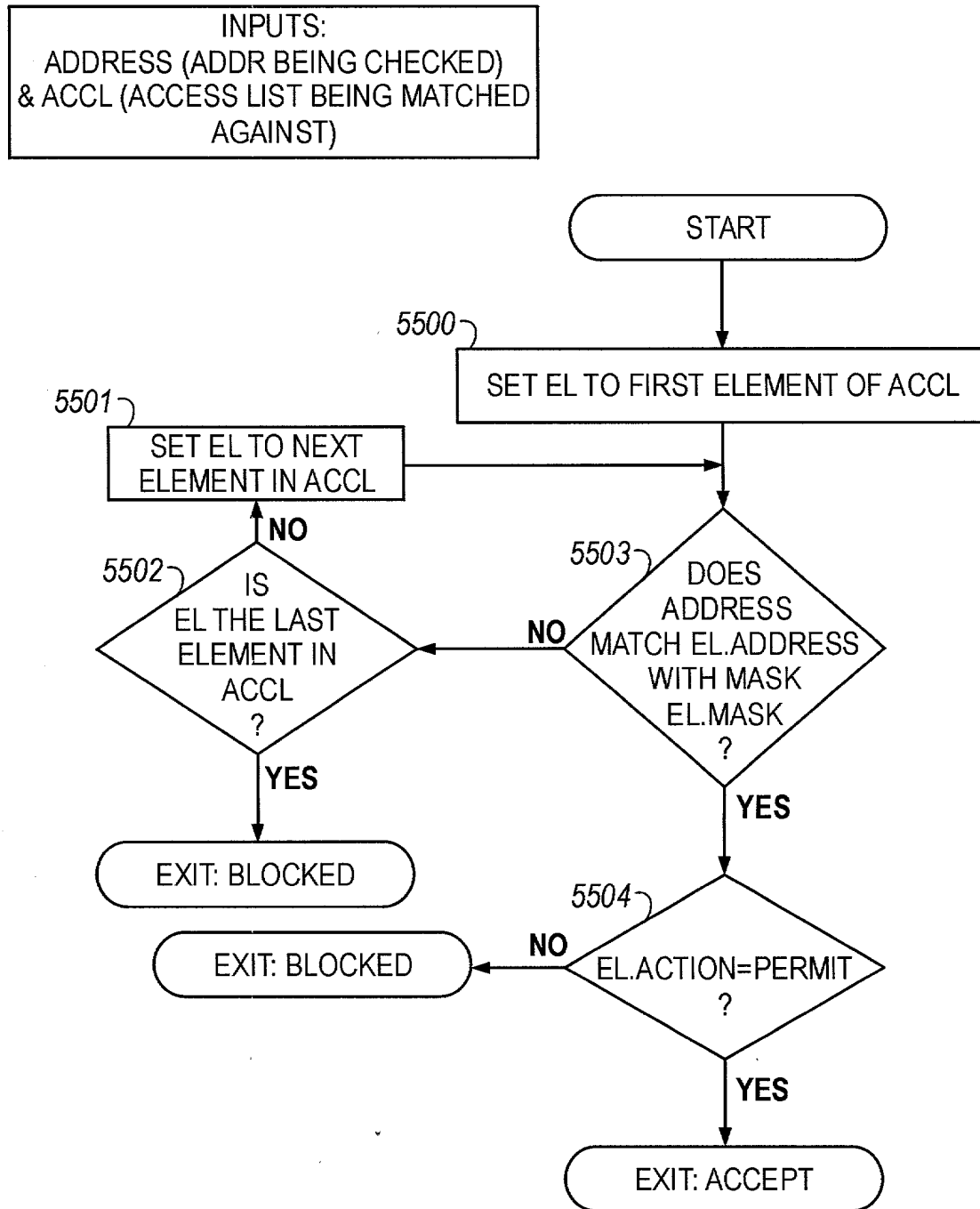


FIG. 55

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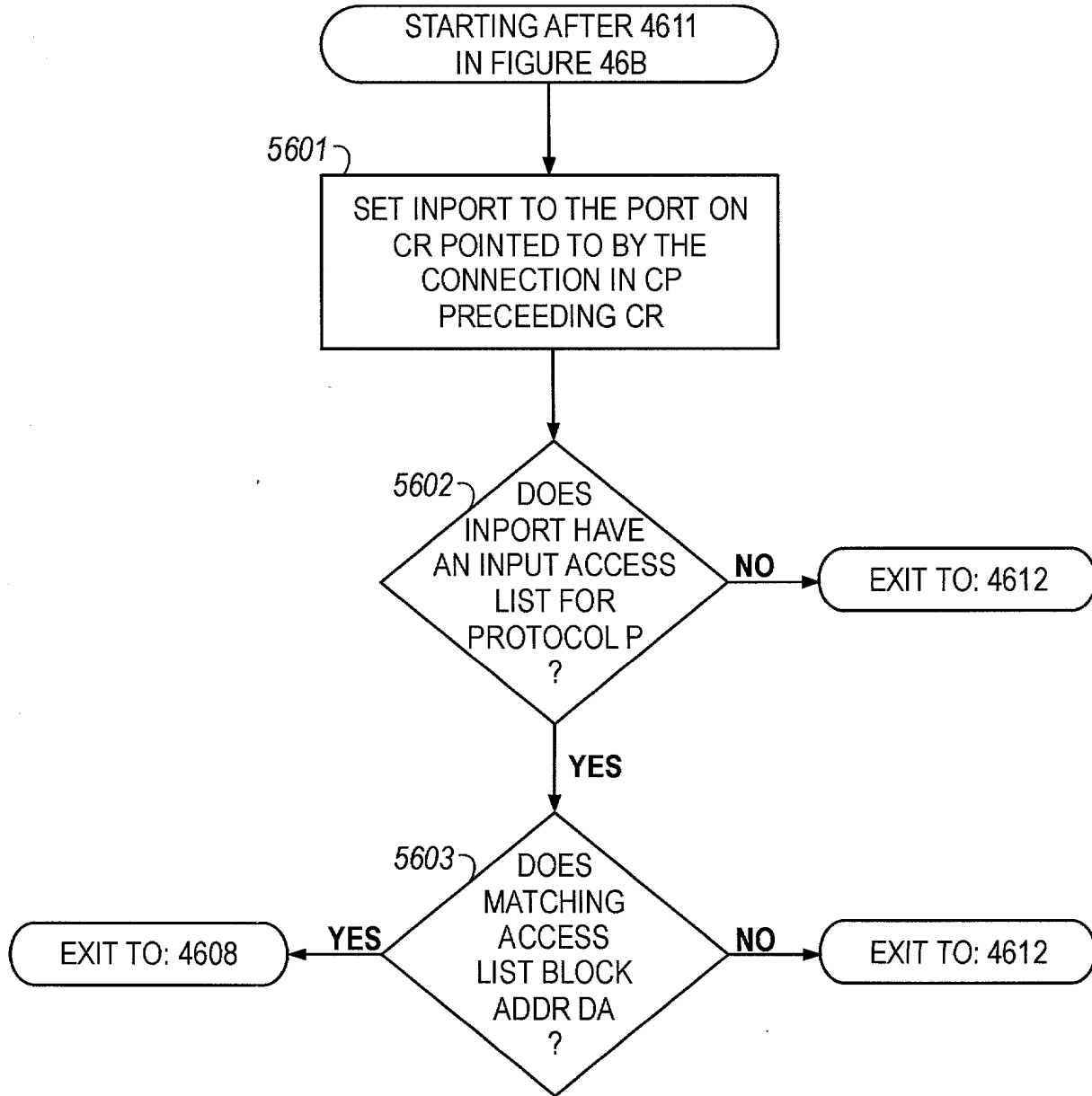


FIG. 56

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NOTE: THIS CHART
INTEGRATES WITH
FIG. 46C

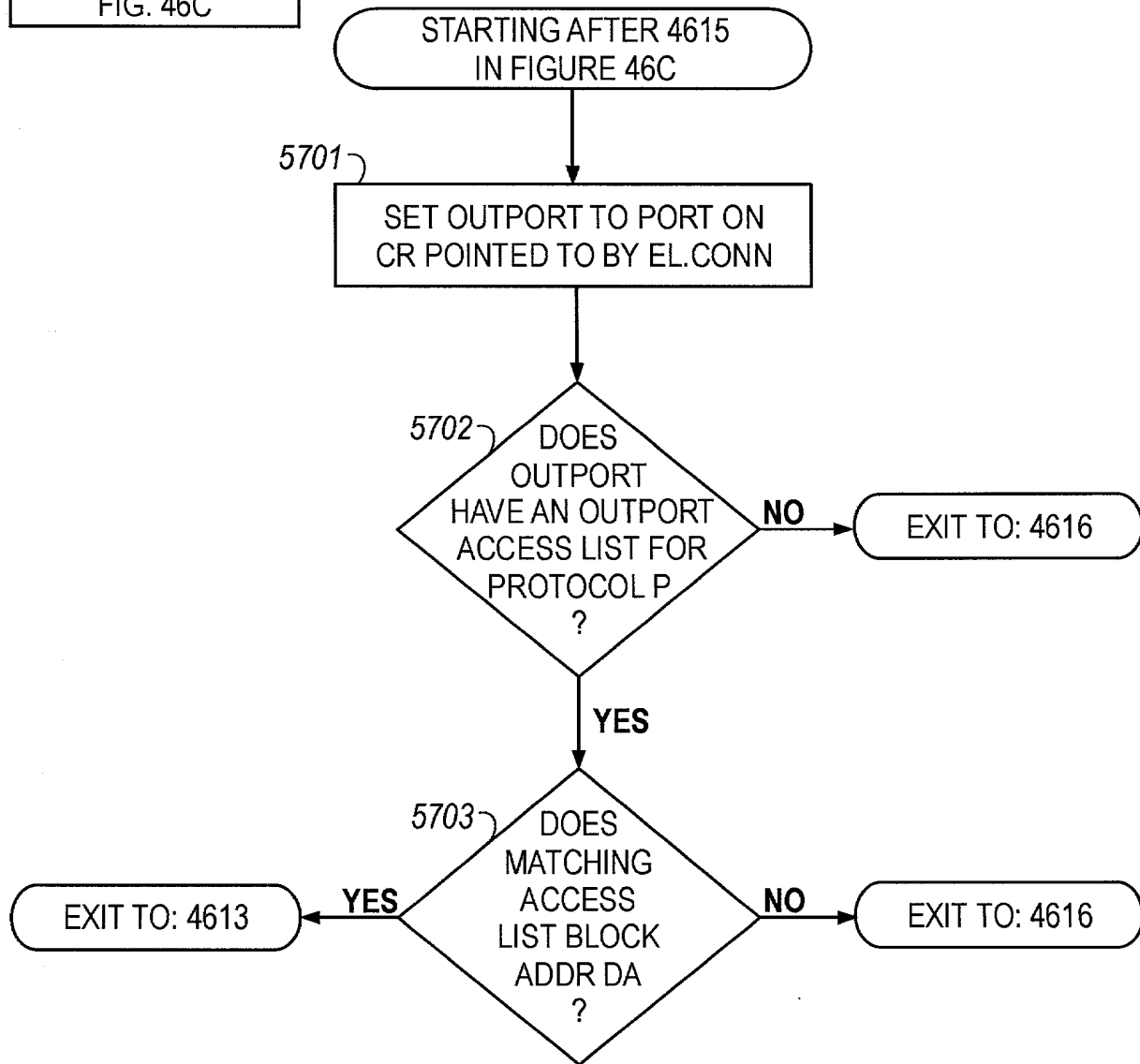


FIG. 57

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NOTE: THIS CHART
INTEGRATES WITH
FIG. 46B

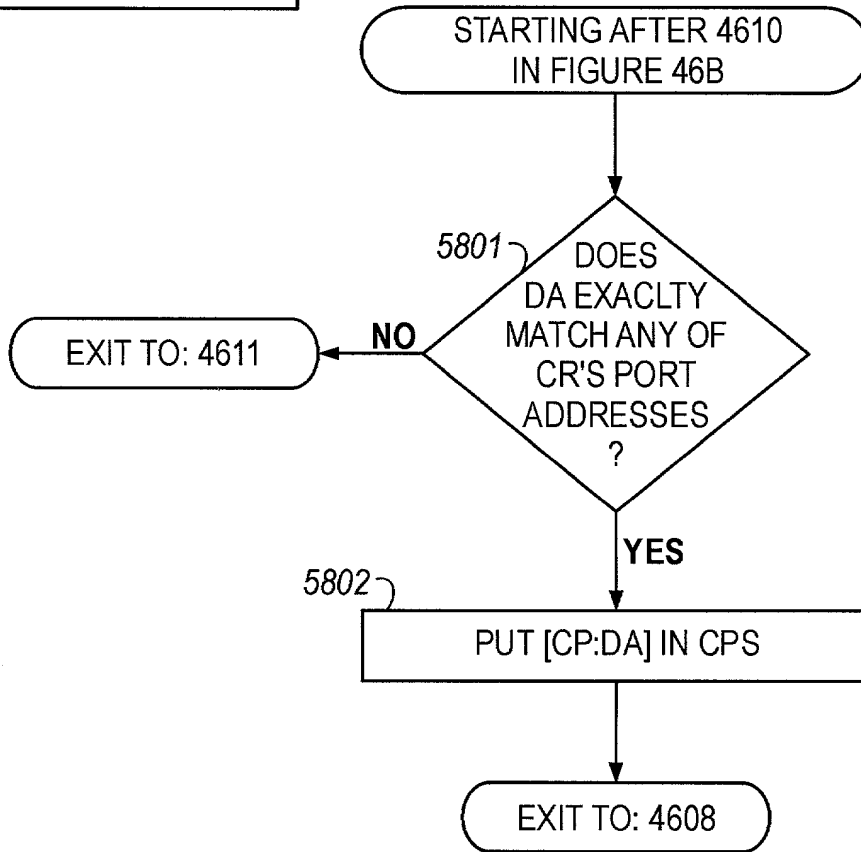


FIG. 58

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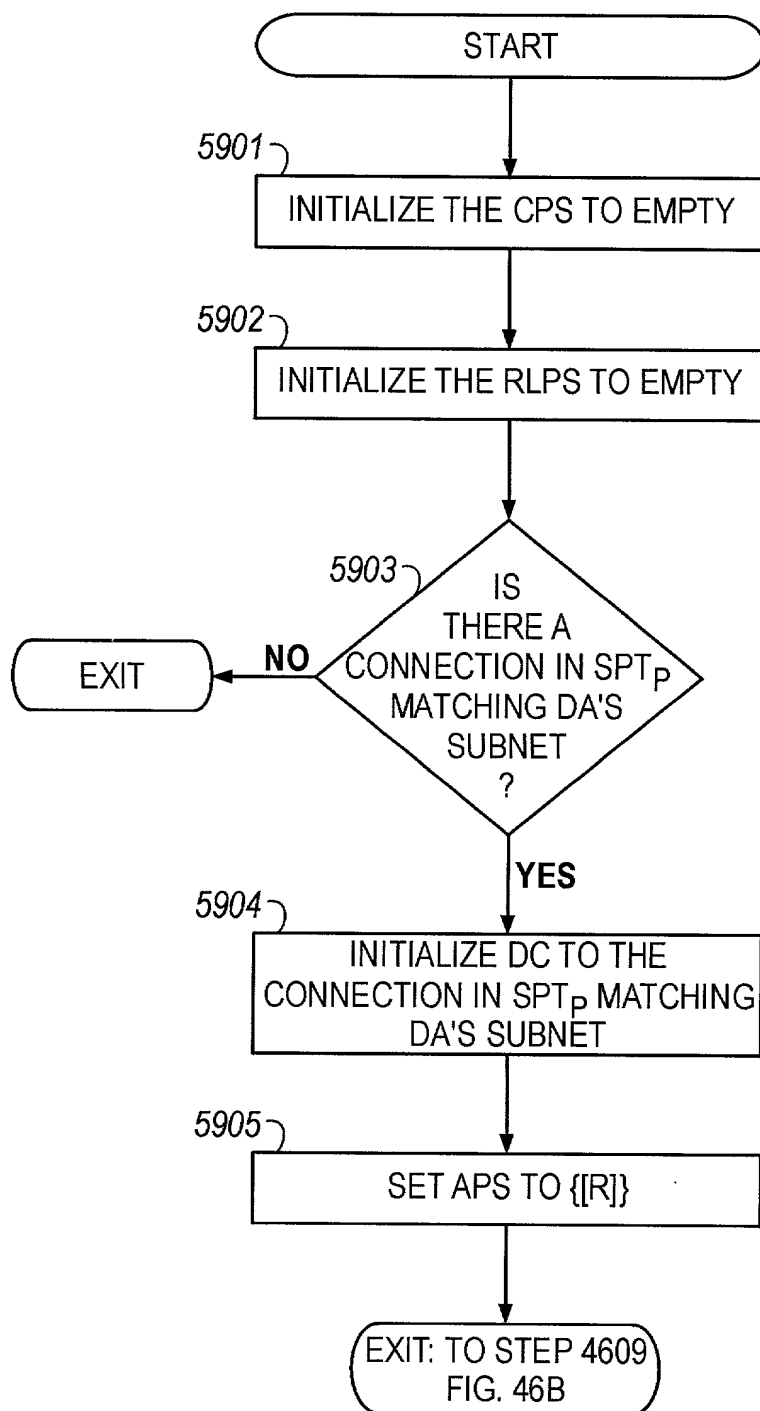


FIG. 59

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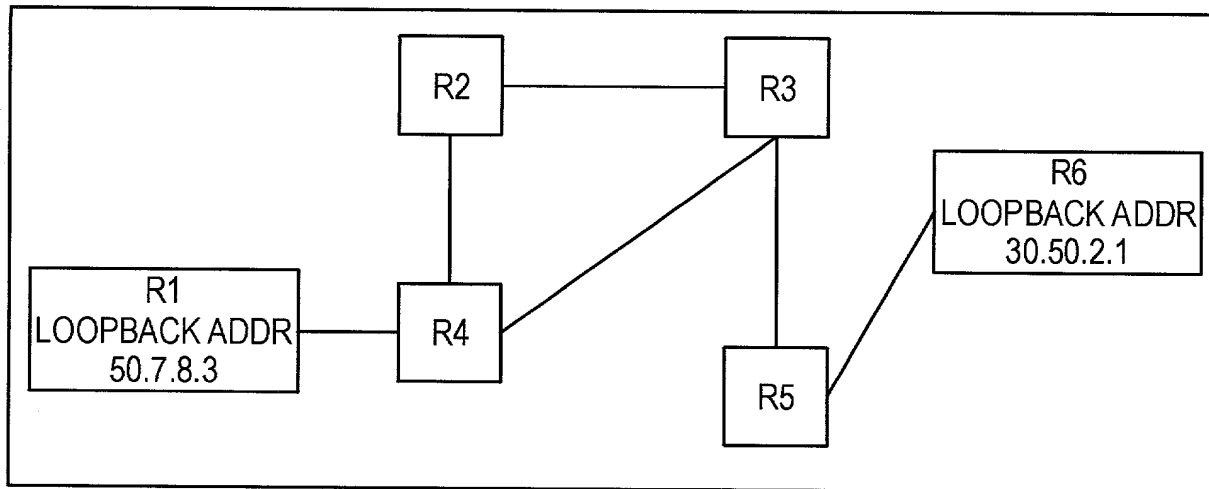


FIG. 60

ROUTER R1:

```
VERSION 10.0
!
HOSTNAME ROUTER1
!
SOURCE-BRIDGE RING-GROUP 7
SOURCE-BRIDGE 7 TCP 30.50.2.1
!
INTERFACE LOOPBACK 1
IP ADDRESS 50.7.8.3 255.255.0.0
!
END
```

FIG. 61A

ROUTER R6:

```
VERSION 10.0
!
HOSTNAME ROUTER6
!
SOURCE-BRIDGE RING-GROUP 7
SOURCE-BRIDGE 7 TCP 50.7.8.3
!
INTERFACE LOOPBACK 0
IP ADDRESS 30.50.2.1 255.255.0.0
!
END
```

FIG. 61B

20250305 50325-0630

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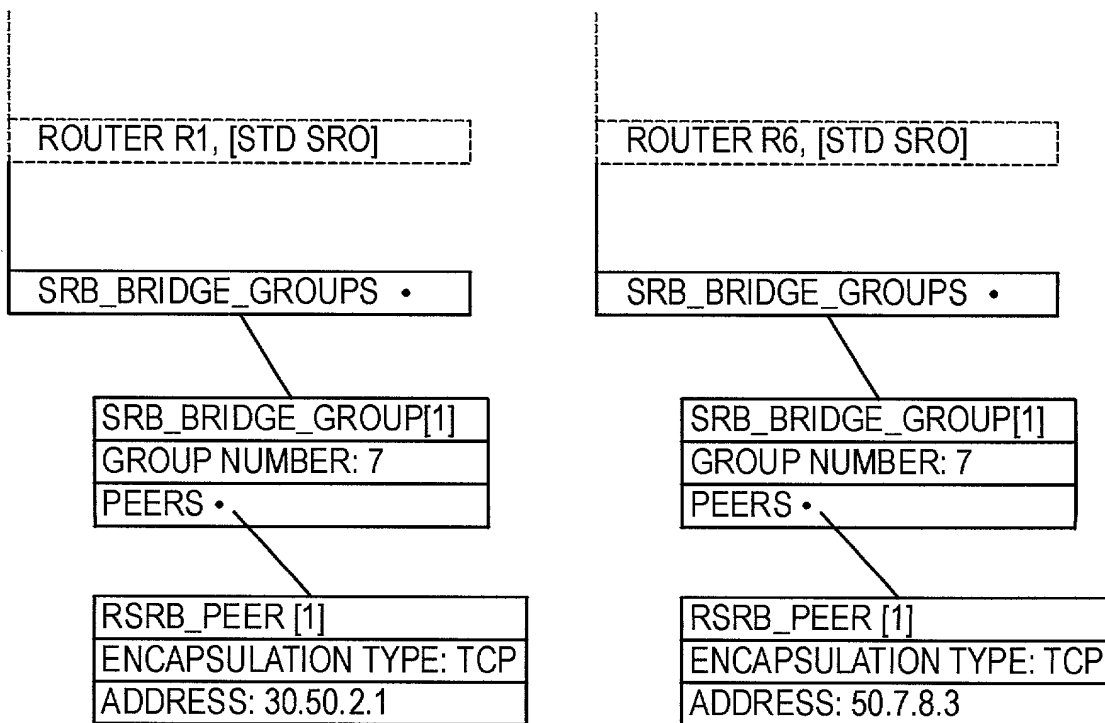


FIG. 62

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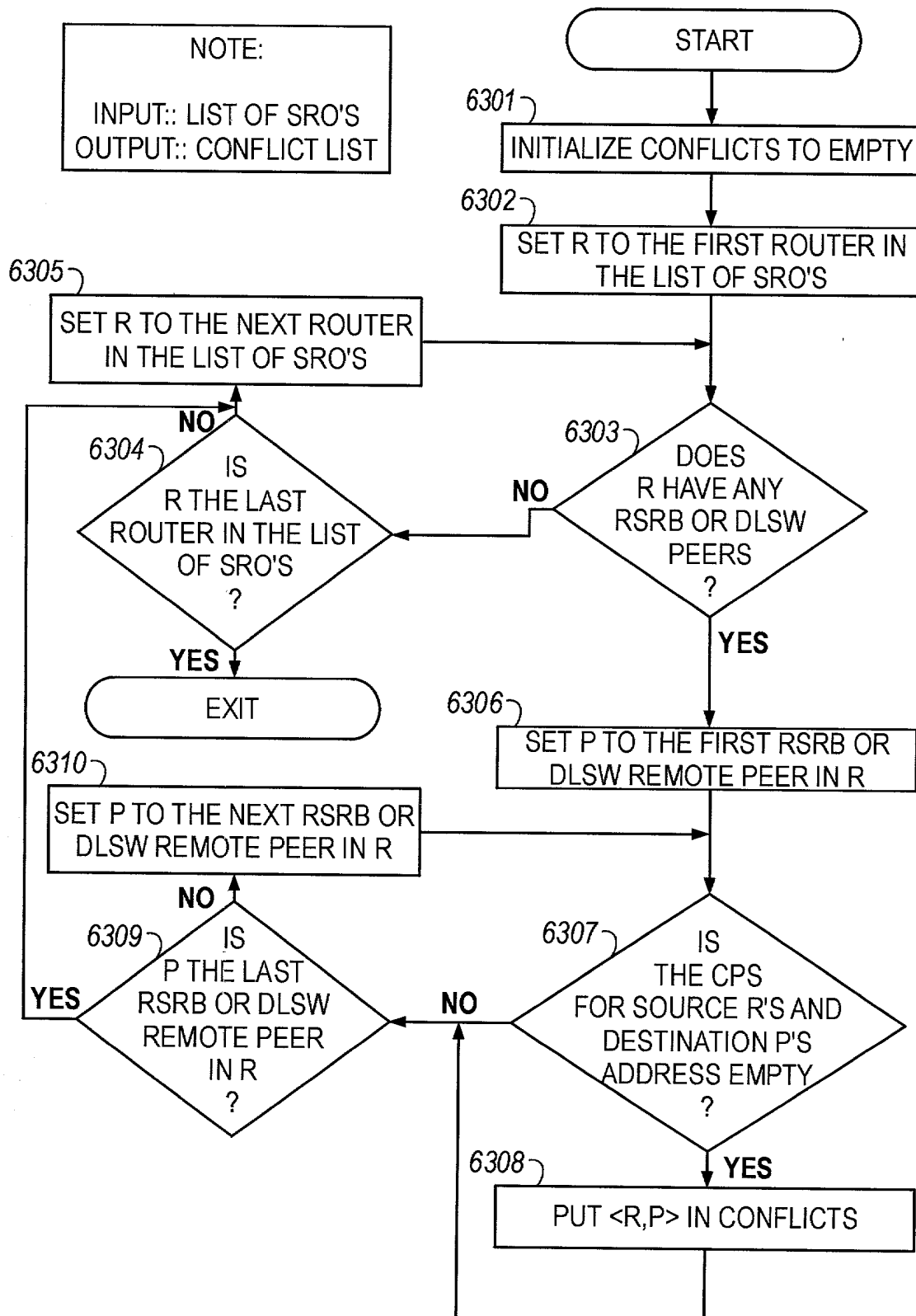


FIG. 63

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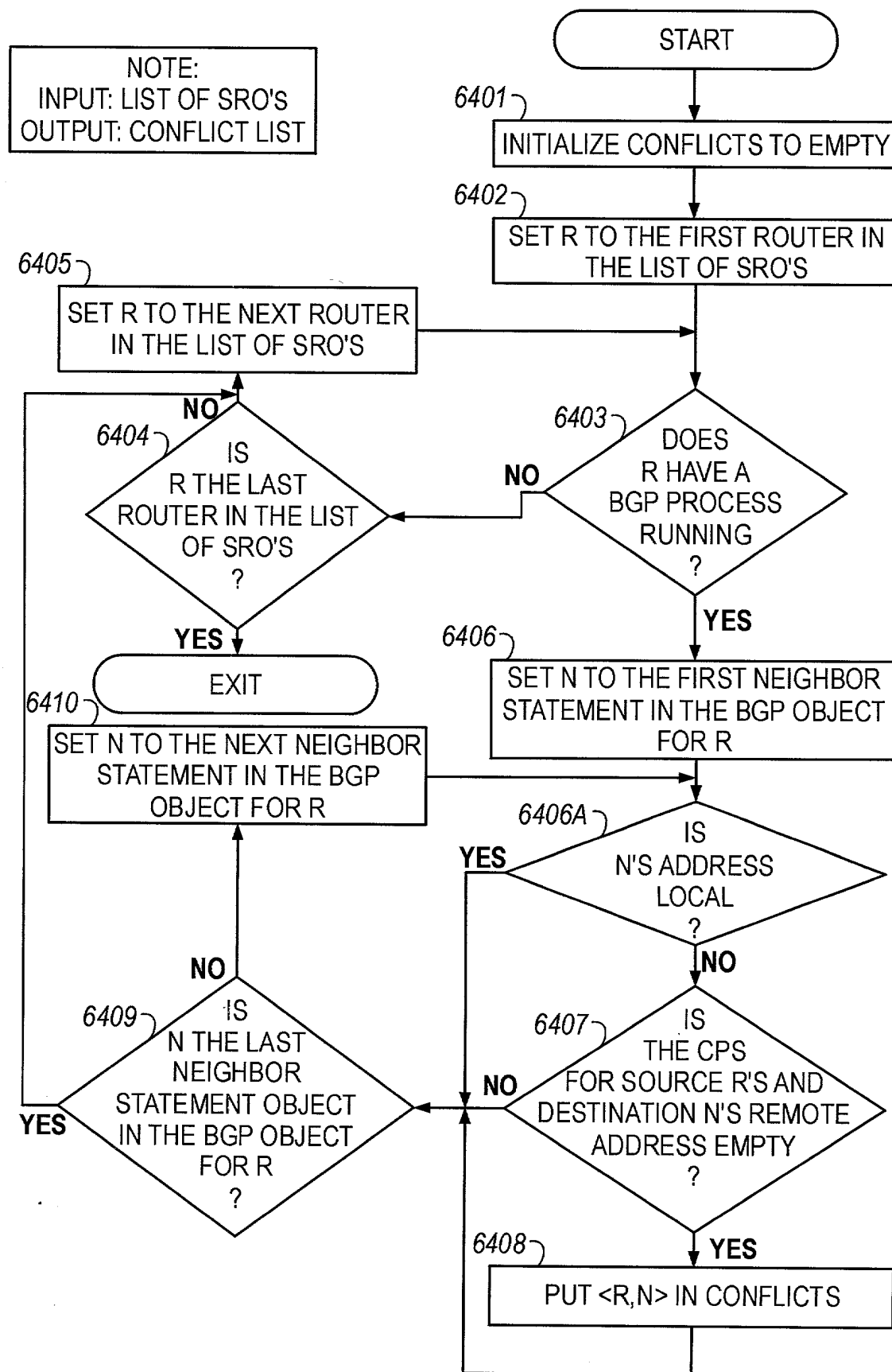


FIG. 64

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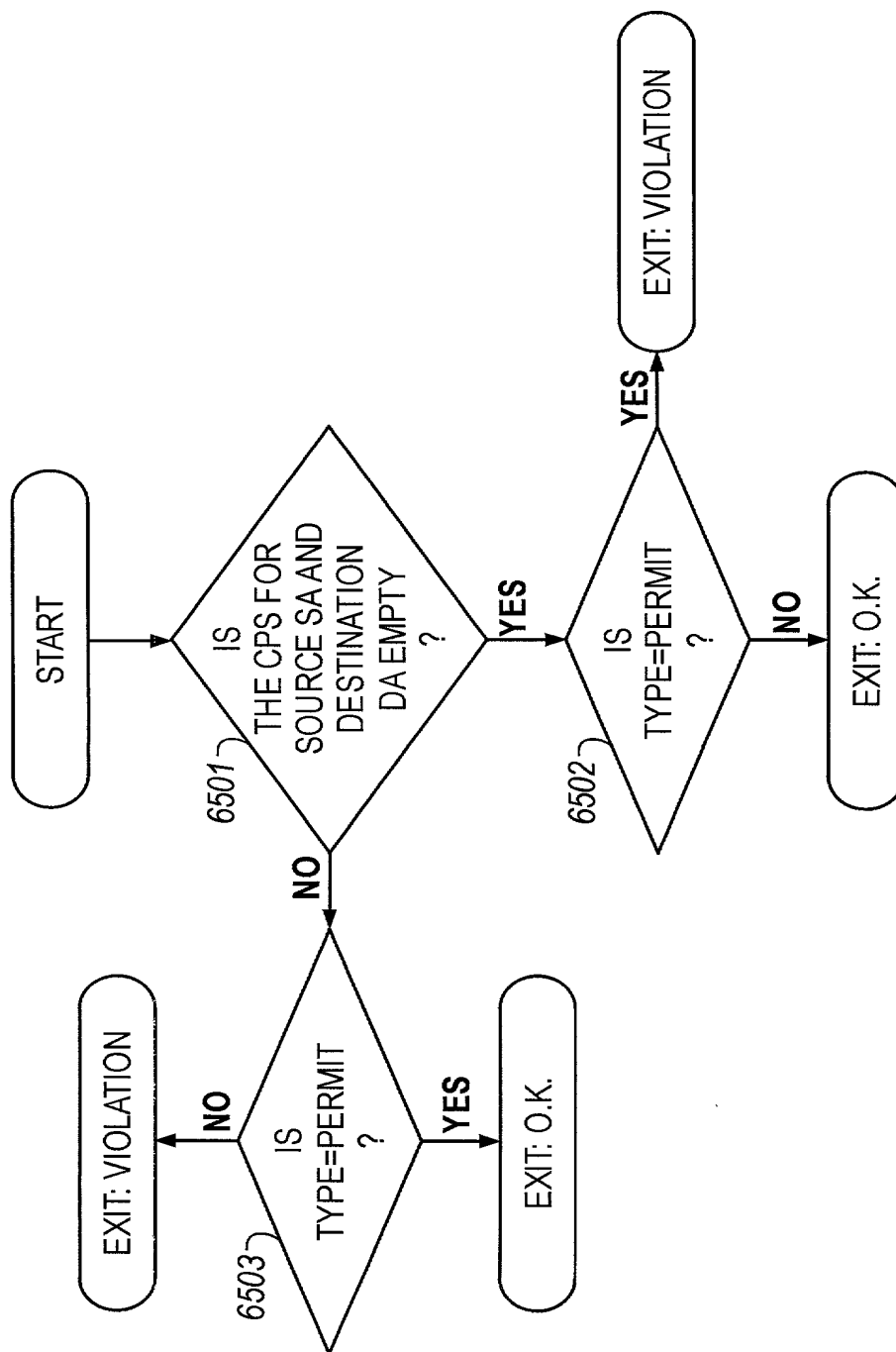


FIG. 65

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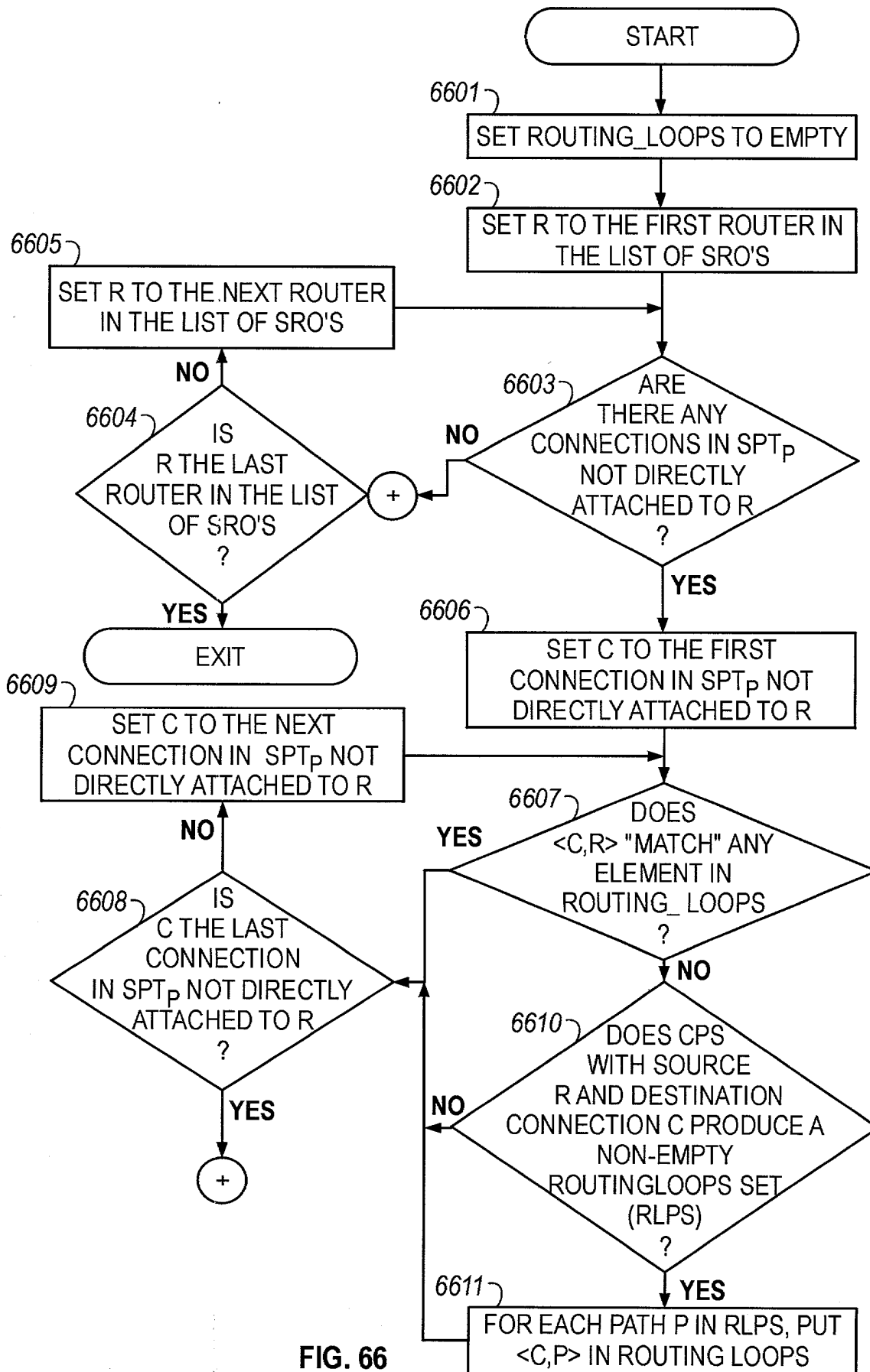


FIG. 66

10074805 0001

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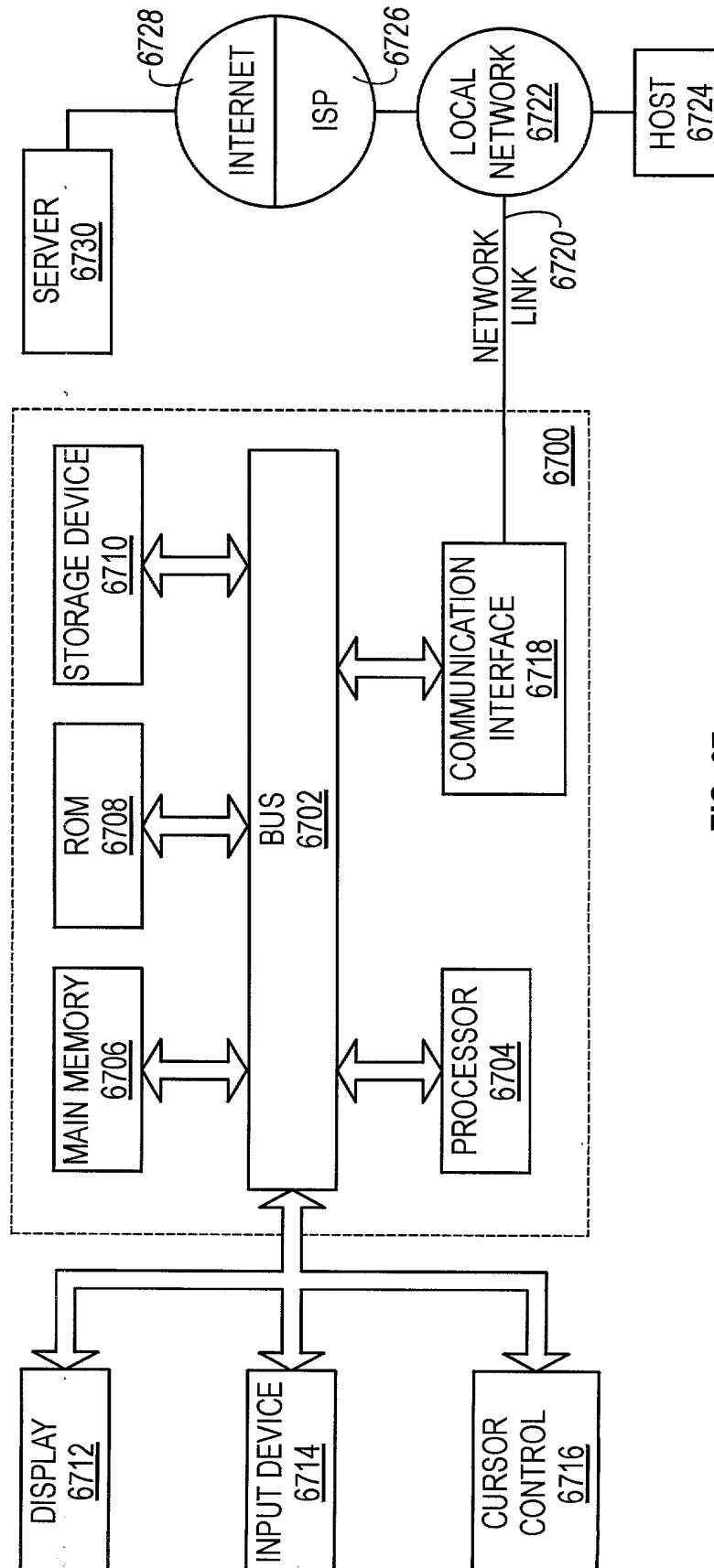


FIG. 67

20250324000